

Winter 2018/2019 Update: Snowshoe Hare Ecology Project



A snowshoe hare rests under brush and snow in the Middle Fork Koyukuk River valley. (Photo by Donna DiFolco, NPS.)

Increases in the snowshoe hare population are driving increased activity by predators and humans alike in the central Brooks Range near Wiseman on the eastern border of Gates of the Arctic National Park and Preserve (Fig. 1). This update summarizes results from the annual hare track and pellet counts, and also provides updates on the additional studies included in the Snowshoe Hare Ecology Project (SHEP), including great-horned owl diet and breeding success, hare geophagy, hare health, and lynx movement studies.

Notable accomplishments this year include the signing of a Cooperative Agreement between NPS and UAF that formalized our collaboration and allows us to share our resources more easily and effectively. Also, the great-

horned owl diet and breeding success study has been completed. Madison McConnell presented her M.S. thesis December 12, 2018.

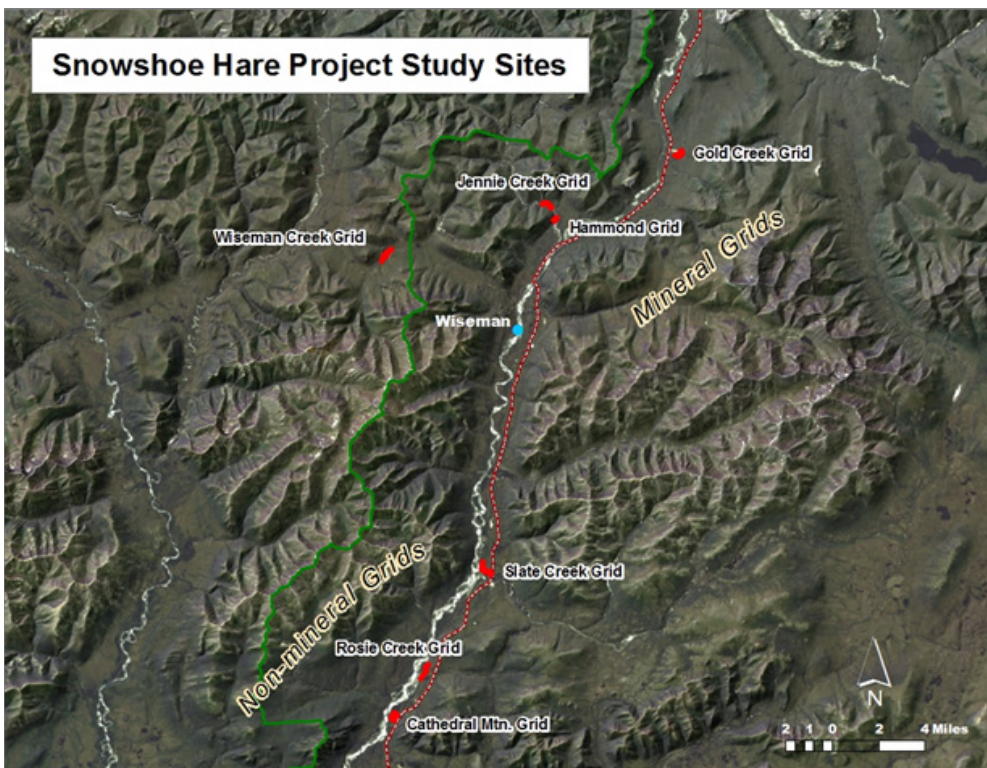


Figure 1. Map of the Snowshoe Hare Ecology Project's (SHEP's) main focal study area, showing the locations of pellet grids at seven sites in the Koyukuk River region in the central Brooks Range near Wiseman, Alaska. The track count takes place within Gates of the Arctic National Park's boundary adjacent to the Wiseman Creek grid. The hare population being studied for snowshoe hare seasonal health is farther north at MP 222 on the Dalton Highway. Live capture for the lynx movement study takes place all along the highway between Cathedral Mountain and MP 222.

Annual Track Count

The 22nd annual hare track count was conducted March 21, 2018. Conditions were fair, with an accumulation of approximately 1" of fresh snow, which fell about 36 hours before the survey. This is within the recommended wait time of 24-48 hours after snowfall before counting tracks. Two people counted tracks (one on each side), totalling an average of 259 tracks, or 78.8 tracks/100m. Numbers were similar to last year, although overall we counted fewer tracks than in 2017 (Fig. 2). However, we are beginning to see more tracks in less favorable (more open) areas, indicating increasingly severe browsing in the more favorable areas with better cover. Again, as in the early years of this track count, we are finding that as hare population densities increase, track count accuracy tends to decline as it becomes more and more difficult to distinguish between the many tracks deposited in the more densely populated areas.

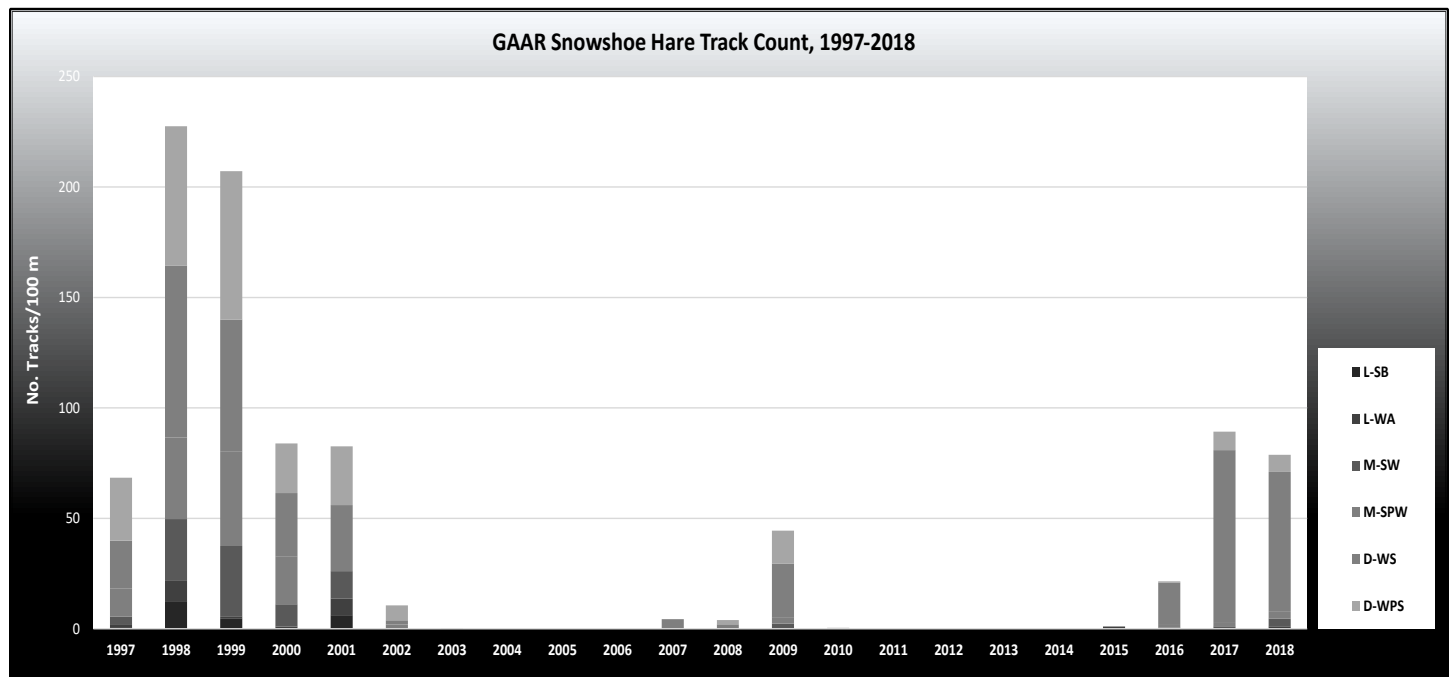


Figure 2. Snowshoe hare tracks per 100 m in eastern Gates of the Arctic National Park near Wiseman, Alaska, 1997 – 2018. The annually surveyed transect is comprised of six different “vegetation cover and composition” (VCC) zones (shown in the bars as different shades), which describe the general amount of cover and the major species found along that portion of the survey line: L=low cover, M=moderate cover, D=dense cover; S=spruce, B=shrub birch, W=willow, A=alder, P=poplar. Each bar in the graph above is divided into the tracks counted per VCC. 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 Pellet Count

The 12th annual hare pellet count was conducted June 4-10, 2018. Three returning youth volunteers (including one local resident of Wiseman) helped to train two new volunteers on the pellet crew this year. Carol Scott, who leads a group of middle school kids annually on a trip up the Dalton Highway to learn first hand about science—North for Science—once again joined us for a day to check the plots at the Hammond site, which they have been collecting annual pellet data on for the past four years. We also had two additional Wiseman residents help us for the day at the Wiseman Creek site in the park (one of them a former AIVC volunteer who had previously helped on the pellet count).

Overall, the pellet count was up for the third year in a row, although the total counts at Rosie and Cathedral, usually our “big sites” for pellets, both non-mineral sites, were down slightly from last year (Fig. 2). Hammond, Jennie, Gold and Slate maintained their strongly positive slopes from last year. Wiseman was also up, despite track count results suggesting otherwise, but not as strongly. The Hammond site, which was established in 2013 (first count in 2014) to replace Jennie in case mining activity erased our plots, seems to be tracking Jennie closely, and should serve as a good substitute should Jennie disappear from mining activity. Due to the mosaic nature of each study area, breaking the total site count down into transects (Fig. 3) gives a better idea of which habitat types are supporting more hares. (Vegetation descriptions, including strata, and densities of trees, shrubs, and winter cover, can be found in an earlier report: DiFolco DL and Maier JA. 2015. Snowshoe hare (*Lepus*

americanus) ecology monitoring in Gates of the Arctic National Park and surrounding areas. Natural Resource Data Series. NPS/GAAR/NRDS—2015/783. National Park Service. Fort Collins, Colorado.)

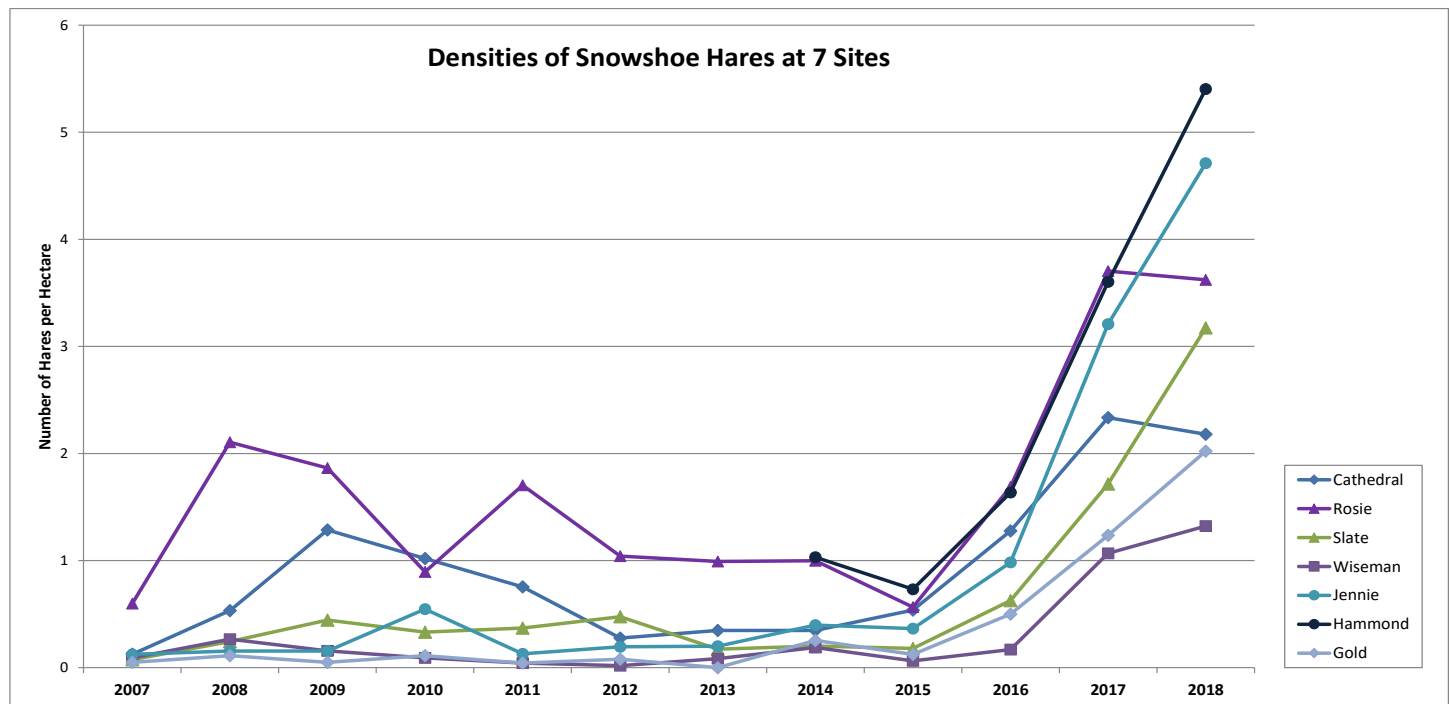


Figure 3. Snowshoe hare population densities (hares/ha) in “mineral” and “non-mineral” areas based on pellet count results at seven sites, 2007-2018, in Gates of the Arctic National Park and neighboring Dalton Highway corridor near Wiseman, Alaska. (The Hammond site count began in 2014.) Cathedral, Rosie and Slate are non-mineral sites; Wiseman, Jennie, Hammond and Gold are mineral sites.

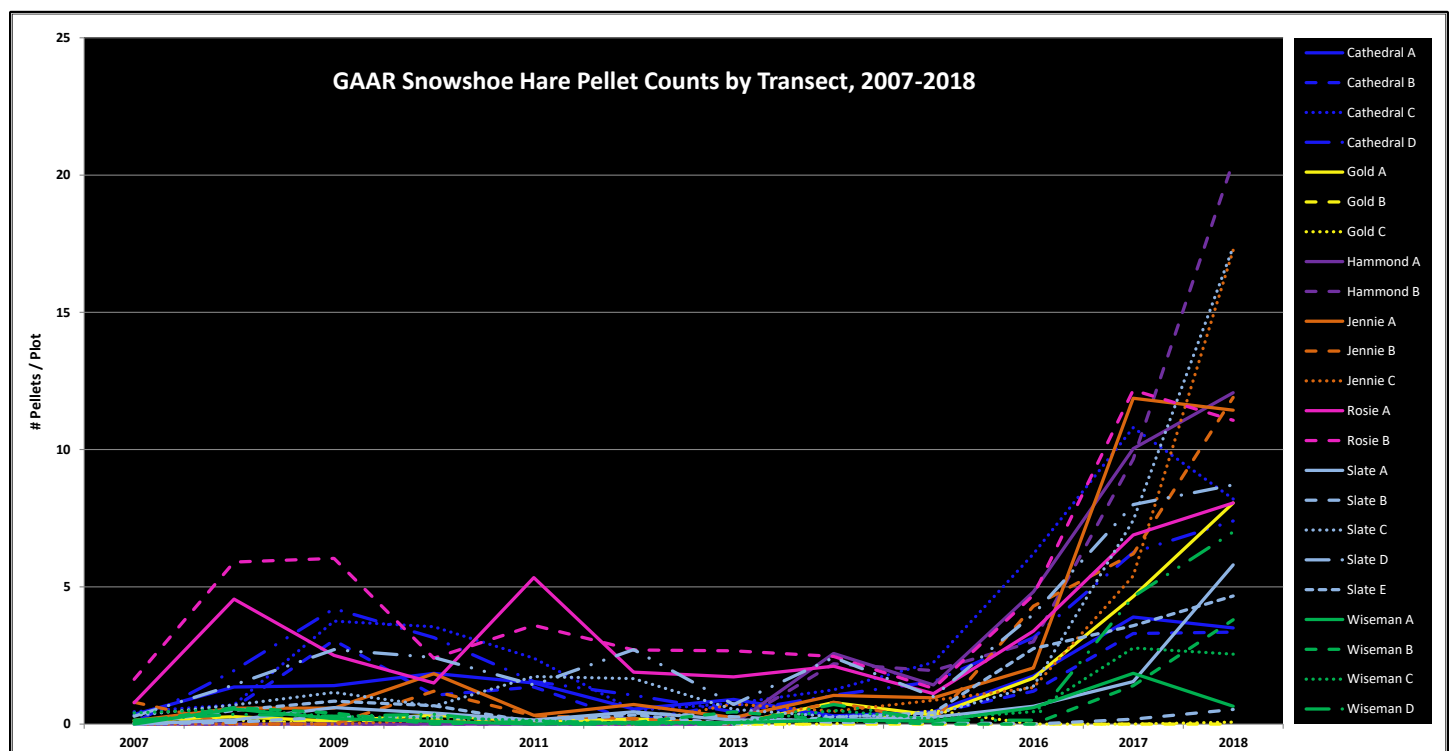


Figure 4. Results of the 2018 snowshoe hare pellet count (pellets/plot) at seven sites, broken down by transect. Cathedral, Rosie and Slate are non-mineral sites; Wiseman, Jennie, Hammond and Gold are mineral sites.



Figure 5. In the Koyukuk/Dietrich River valley, great-horned owls primarily utilize “witch’s brooms” in spruce trees for nests. They also make use of shelves on cliffs and the platforms under the pipeline, as shown in this photo. Great-horned owls do not build their own nests but take over nests built by other birds, such as ravens. (Trail cam photo courtesy of Madison McConnell.)

Great-horned Owl Diet and Breeding Success

Diet, breeding success, detectability and density of the great-horned owl in arctic Alaska is the title of the thesis recently defended by UAF graduate student Madison McConnell. Using camera traps focused on nests (Fig. 5) and analyzing owl pellets, Madi discovered that the great-horned owls living within our study area utilized 18 different prey types. Over 90% of their diet was composed of snowshoe hare. Mean prey size was 2-25 times the prey size found in other studies, and chicks left the nest an average of 6 days earlier. One mystery that was solved by using trail cameras *under* nest trees was discovering who was responsible for the disappearance of owl pellets. Snowshoe hares were the main culprit, making up to 8 visits a day to consume the calcium and phosphorus rich pellets ejected from the nests by the owls.

Snowshoe Hare Geophagy

The deployment of trail cameras at licks and GPS collars on snowshoe hares has helped us to learn more about snowshoe hare geophagy. Photographic data from 2 cameras and location data from 2 hares were used to make a poster presentation at the Alaska Chapter of The Wildlife Society meeting in Anchorage in late March 2018, and more recently, an article was published in *Ecology* on snowshoe hare geophagy (Kielland et al. 2018). It appears that hares living within range of a lick use it on a regular basis. What we are still hoping to learn, however, is how many different individuals may be using a particular lick, and how far a hare will travel to access a lick if there is not one within its home range. I am currently looking into the possibility of using environmental DNA analysis (e.g. from snow tracks) to help us determine how many different individuals may be using a particular lick. I have contacted Sandy Talbot at US Geological Survey for guidance on how to collect and analyze this type of data. Dr. Kielland has a new graduate student, Mary Evans, who is looking into hare geophagy as a focus for her thesis.



Figure 6. A snowshoe hare visits a dirt mound lick at night on the Nolan Flats just east of Gates of the Arctic National Park. Although it's October, no snow has yet accumulated and the white hare is in obvious contrast to the surrounding brown landscape, suggesting a serious desire for minerals given the risks at stake in obtaining them. (Trail cam photo by Donna DiFolco, NPS.)

Snowshoe Hare Health

The seasonal patterns of nutritional condition and survival of snowshoe hares is another topic for a graduate student thesis being conducted by Claire Montgomerie. Claire is studying seasonal changes in snowshoe hare health and body condition during a snowshoe hare population high. To monitor the health of the population over the course of a year, Claire collects blood samples in different seasons to analyze them for a suite of health parameters, including stress levels. She is planning to wrap up her study this spring and present her findings in summer 2019.

Lynx Movements Study

Our collaboration with UAF on the lynx project, which began in 2015, has expanded to include several US Fish & Wildlife (USFWS) refuges across northern Alaska, including Tetlin, Yukon Flats, Kanuti, and Koyukuk/Nowitna. Dr. Knut Kielland is the Principal Investigator, providing study design and is the lead in data collection efforts at Bonanza Creek and SHEP's site adjacent to GAAR. He also secures the necessary permits pertaining to IACUC and the State of Alaska. The Northwest Boreal Lynx Working Group met January 31, 2019, to discuss and finalize a Memorandum of Understanding, which formalizes our partnership among the agencies and entities involved in this collaboration with the purpose of establishing a framework in which to achieve the group's objectives. The MOU was signed by NPS, USFWS and UAF in early February, 2019. During the January meeting, the Lynx Working Group also discussed methods and protocols, trapping successes and failures, data findings, and snowshoe hare population densities at the various study sites.

Data from collared lynx are collected and displayed on an online program called Shinyapp that USFWS has set up for the group's collar location data. At our site by GAAR, we experience a high mortality rate at our site as it runs along the Dalton Highway where there is significant trapping pressure from both subsistence and other local users (e.g. State DOT employees). Approximately 50% of the lynx we collar in the Koyukuk/Dietrich valley area have resulted in mortalities, whereas the mortality rate for the entire study area (all sites) is 18.5% (13 of 70 collars). Our co-investigatigators at the refuges are able to work out of more remote locations within their borders, farther away from human activity. Our request to live-trap lynx in the Park, away from most trapping activity, has been denied. We still hope to pursue setting traps farther away from the road (outside the Park) this trapping season (begining in February) in order to capture lynx with a higher probability of survival for a longer period.

Despite the challenges, we are proceeding with our study of lynx movements in the Koyukuk/Dietrich rivers valley. Matt Kynoch, another graduate student of Dr. Kielland's, is attaching accelerometers to the collars to investigate lynx energetics--what proportion of time lynx spend in various acitivites, such as hunting, chasing prey, or resting.

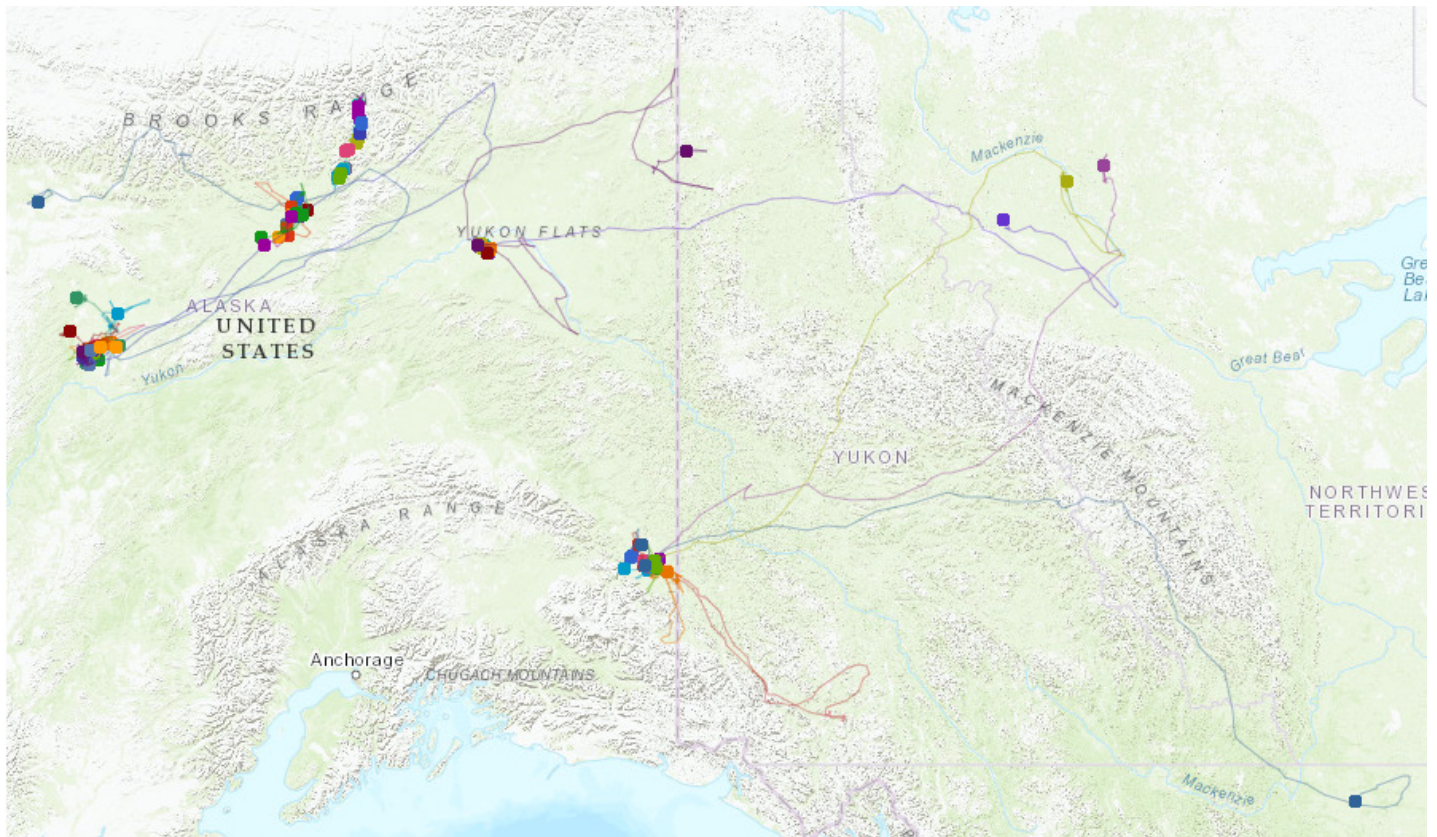


Figure 7. Screenshot of the Shinyapp website on November 16, 2018, showing the locations of lynx being monitored by the Northwest Boreal Lynx Working Group, a collaboration of investigators from University of Alaska Fairbanks, US Fish & Wildlife Service, and the National Park Service. Some lynx have moved great distances since being collared. Those in SHEP's study area near Gates of the Arctic National Park & Preserve appear to remain in more localized areas. This difference in movement patterns may be a reflection of snowshoe hare densities in the respective areas. Data are preliminary and are not open for public view.