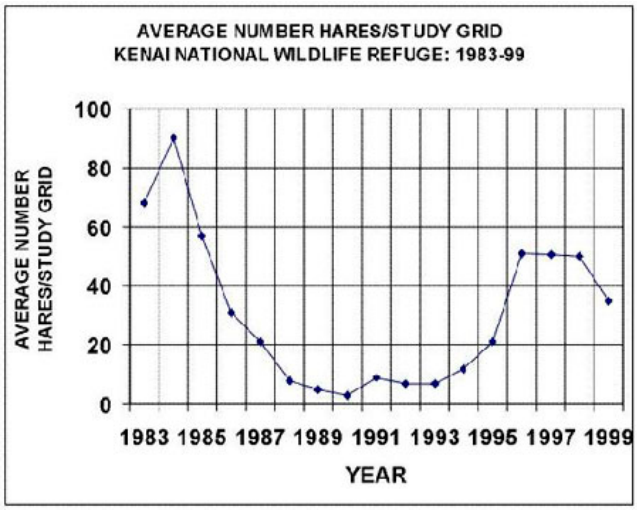
Peninsula snowshoe hares on the decline

by Ted Bailey

Snowshoe hares have reached their peak population density and are declining again in numbers on the Kenai Peninsula. Each year since 1983 we have been monitoring the snowshoe hare population on the refuge. In each of 2-5 study grids 49 box traps are set in a 7×7 trap array and all live-captured hares are ear-tagged, sexed, weighed and released over a 14 day period. The same study grids are sampled year after year and the traps are set in the same places during the same time periods for consistency of data from year to year. The numbers of snowshoe hares captured and recaptured, the specific box traps they are captured in, and the distances between capture locations are used to determine the numbers and densities of snowshoe hares in the area. In addition and as an alternate method of estimating the snowshoe hare population, the pellets of hares are counted in the same one square meter area near each trapsite year after year.

Periodically the vegetation in the study grid is assessed by counting and measuring distances to trees, sapling stems, and dead saplings killed by hares girdling the bark. The numbers and percentages of stems browsed by hares and moose are also counted.

The average numbers of snowshoe hares captured per study grid since 1983 is shown in the accompanying chart. The snowshoe hare cycle is one of the most frequently cited examples of a cyclic animal population in textbooks on animal ecology. In general, snowshoe hares show cyclic fluctuations of up to 5-25 times in density across North America with peak densities every 8-11 years. But we have discovered that snowshoe hares on the Kenai Peninsula are a asynchronous population meaning that they are out of phase with the rest of snowshoe hare populations across North America and mainland Alaska. However, at least one, possibly two, other studied snowshoe hare populations also appears out of phase with the continental hare cycle which last peaked in 1990-91. The previous cyclic peak on the Kenai Peninsula occurred in 1984-85 and the current peak appears to have been in 1997-98. The Kenai Peninsula hare population is not only out-of-phase with other North American and mainland Alaska populations, it was also longer between peaks. The number of years between the last two peaks was 12-14 years dependent on which year you begin and end counting.



The exact reasons for the asynchrony and longer length of the snowshoe hare cycle on the Kenai Peninsula remain uncertain. Two of the known areas where snowshoe hares are out of phase are at the opposite sides and near the ends of the distribution or geographic range of snowshoe hares in North America. Newfoundland lies at the extreme eastern end of their range and the Kenai Peninsula lies near the western extremity of their range. Snowshoe hares did not naturally occur in Newfoundland but were introduced their in the late 1800's. Both areas share some common characteristics. Both are isolated from the nearby mainland because they are islands (Newfoundland) or near-islands (Kenai Peninsula). Furthermore, the climates in both areas are coastal. The coastal or maritime influence on local weather patterns might be great enough to change the synchrony.

A factor which may be responsible for the continental-wide synchrony of the hare cycle are sunspots which also are on a 10-11 year cycle. Many investigators have noticed the high correlation between the sunspot cycle and the snowshoe hare cycle but the precise factors in the environment influencing hares remains unknown. Because sunspots are also correlated with weather patterns, snowfall, wildfires and other environmental factors, it is specu-

lated that perhaps sunspots influence the climate and are thus responsible for synchronizing the hare cycle. Some recent research has suggested a connection between sunspots, ultra-violet radiation, the ozone layer in the earth's atmosphere, and warmer temperatures at higher northern latitudes.

An understanding of basic snowshoe hare biology and ecology is necessary in order to attempt to understand the snowshoe hare. At the input end of the population equation is reproduction. Reproduction is an important aspect of snowshoe hare biology and under ideal conditions hares can produce many young. Hares do not breed until one year following their birth. Then, each female has 1-4 litters per summer and between 1-14 baby hares (leverets) are born per litter. Early born litters nurse for about 24-28 days but later-born litters may be nursed longer up to 40 days. Under less than ideal conditions - when hares are declining - they may only have 2 litters per summer. At the other end of the population equation are the fates of hares. The causes of death and mortality rates of hares are another important component of the cyclic population equation.

Most snowshoe hares die of predation. Although snowshoe hares can live 5-6 years in the wild, over 70% are taken by predators each year. In some areas that have been intensively studied, between 81-100% of the monitored hares were killed by predators each year. Hares are an important food of both avian predators (raptors) and terrestrial (ground) predators. When hares are small they are taken by smaller predators including red squirrels, weasels (ermine), hawk-owls and other smaller raptors.

Adult hares are taken by great horned owls, goshawks coyotes, and lynx.. Since great horned owl and goshawks take both young and adult hares, they may be especially important as predators on snowshoe hares throughout the cycle. Higher proportions of snowshoe hares are taken by predators during the decline and low phases or the cycle than during the increase and peak phases.

And hares living in small patches of habitat appear to suffer higher mortality rates from predators than hares living in large blocks of habitat. Habitats themselves also have an influence on snowshoe hare densities. A recent summary of snowshoe hare habitat selection information indicated that hares appear to select habitats for protective cover from predators rather than for food and that dense understory vegetation is more important to hares than higher tree canopy closure. On the Kenai Peninsula, peak snowshoe hare densities in the 1947 burn declined about 50% between the 1984-85 to 1997-98 peaks. Measurements of vegetation in these habitats suggests less food is available to hares in the winter because of heavy browsing by hares during the past cycle, competition with and concurrent heavy browsing by moose, and a less dense protective understory. In contrast, hare densities in the younger 1969 burn were higher than in the 1947 burn area during the 1997-98 peak because of a more abundant food supply and increasing protective cover from spruce trees in the understory Hares appear to avoid open habitats despite the presence of food because they are subject to higher predation rates in open habitats.

Although hares have been known to disperse up to 12 miles, most spend their lives in a home range of 12-25 acres. Hares do not maintain territories, their home ranges overlap, and the home ranges of male hares are larger than those of female hares.

Hares move less in the winter than in the summer possibly to conserve energy and minimize exposure to the cold. In the winter, hares take advantage of warmer microclimates under dense shrubs. These obstructions intercept outgoing radiation from the snow at night and reradiate it back to the snow surface making it warmer than in open areas. Hares appear to need about half a pound of browse each day. To extract the most nutrient value from a low protein winter-browse diet, they excrete fibrous pellets quickly through their digestive system, and then reingest, or eat their own soft pellets again, to extract additional proteins and other nutrients.

Some woody plants (birch, alders, poplars) naturally contain, or respond to browsing by hares by producing, secondary compounds that make the plant unpalatable to feeding hares. Much of the work on this interesting aspect of snowshoe hare and plant ecology has been done by Dr. John Bryant at the University of Alaska in Fairbanks. For example, the numerous, resinous, small "bumps" one sees along the small stems of birch that are being browsed by hares and moose contain these compounds which makes them unpalatable to hares.

Despite the information and experiments on snowshoe hare populations a single and precise explanation of the snowshoe hare cycle is still forthcoming and may be unrealistic. It is unlikely that there is a single, simple cause and the more information we obtain, the more questions arise and the more complex we re-

alize the unique phenomenon really is. One aspect most biologist agree upon is that the cycle is caused by the complex interactions between hares and their food plants and between hares and their predators. Factors such as mass starvation, diseases and parasites, and stress-related hormones may contribute to but appear to play secondary roles in the cycle. Someday a complex ecological model may be developed that is close to reality, but in the meantime populations of snowshoe hares will continue to rise and fall into the foreseeable future.

Ted Bailey, a supervisory wildlife biologist, has been responsible for the Kenai National Wildlife Refuge's biological programs for over 20 years. He and his staff monitor and conduct studies on a variety of refuge wildlife populations. He and his wife Mary live near Soldotna.