Introduction

Northern snowshoe hare populations experience cyclical fluctuations approximately a decade in length. At peak densities, hares disperse into less preferred habitat in order to forage. The resulting change in structural cover has consequences on the sources and rates of predation. Cover changes seasonally with leafing events in summer and accumulation of snow in winter, while sources of predation change seasonally according to prey availability. The four primary predators of snowshoe hares in the boreal forest are the lynx (Lynx canadensis), coyote (Canis latrans), great horned owl (Bubo virginianus), and northern goshawk (Accipiter gentilis). Each of these predators exhibits both numeric and functional responses to hare abundance. This study investigates the relationship between seasonal changes in structural cover, and sources and rates of predation of snowshoe hares in the Bonanza Creek Experimental Forest. The population of hares in the study area is expected to have peaked in 2009 and begun to crash this winter. Due to dispersal into suboptimal habitat, I predict that rates of predation will be inversely proportional to levels of structural cover.

Methods

Snowshoe hares are being live-trapped at two sites in the Bonanza Creek Experimental Forest, one in black spruce forest and the other in riparian woodlands dominated by alder (Alnus spp.) and willow (Salix spp.). Captured hares were outfitted with VHF radio collars beginning in June 2008. The radio collars are equipped with a sensor that doubles the emitted pulse rate after six hours of inactivity, indicating mortality. Collared hares are monitored weekly using radio telemetry, and mortalities are located on foot. Source of mortality is identified by field sign such as tracks, scat, and portion of hare remaining. Intact hares are autopsied to identify any bruising or puncture wounds that would indicate predation. Additional hares are re-collared as needed to maintain a sample size of 25 on each study site.

Snowshoe hares require cover 1 m in height for concealment from terrestrial predators and 3 m in height for concealment from avian predators. Horizontal cover is being measured as percent visibility, seasonally four times per year, using a 30 x 40 cm density board placed vertically against the ground. From kneeling height, measurements are taken in 5 m distance intervals from the density board until the board is no longer visible.

Preliminary Results and Discussion

Since June of 2009, a total of 20 radio-collared hare mortalities have been recorded on the riparian site and 21 on the black spruce site (Fig. 1 and Fig. 2). While 2 starvation occurred on the riparian site, there were none on the black spruce site. Many of the mortalities were found outside of the study site on which the hares were collared (43% from the black spruce, 60% from the riparian). Thus, the habitat of the study site is not always an accurate representation of the habitat in which the hares were predated. Of particular note are the number of hares dispersing into higher elevations adjacent to the black spruce site, and the higher rate of avian predation in those areas than on the black spruce site proper. Cover characteristics will be measured at each kill site to account for these differences.

Based on radio collar data, there is a general trend of decreased monthly survival rates through the winter (Fig. 3), beginning in September. Survival on both the riparian and spruce sites fluctuate in the same direction, but the riparian site fluctuations are of greater magnitude. In addition, riparian survival has alternately been greater and less than spruce survival. These patterns may be attributable to the amount of snow present on vegetation. One might expect a greater difference in predation rates on the riparian site where the accumulation of snow on limbs could quickly double the cover offered by bare limbs alone. Accumulation of snow in black spruce forest, though considerable, may not affect rates of predation appreciably due to high levels of cover already present year-round.

Radio collar data show a cumulative survival estimate near 40% since June of 2009 for both the riparian and black spruce sites (Fig. 4). Summer is clearly a period of higher survival rates with no mortalities recorded among collared hares on either study site until September.

Mean horizontal cover measured in August 2008 and October 2009 was higher in the black spruce site than in the riparian site (Fig. 5). This would suggest higher levels of predation in the riparian site at these times if cover was a strong determinant of predation rates. However, this elevated rate of predation is not reflected in the monthly survival data as of yet.

Supported by the NSF - Bonanza Creek LTER program