**Evaluating American marten habitat quality using airborne LiDAR**

Understanding animal-habitat relationships is a common focus of ecological research that has important implications for species conservation. Most studies on animal habitat selection focus on describing characteristics of sites used by animals. One major limitation of descriptive studies is that they rarely distinguish between the relative qualities of habitat used by different individuals within a population. Habitat quality is influenced by both resource availability and mortality risk. Few studies have incorporated mortality risk into a comprehensive understanding of habitat quality, partly because data on habitat resources and risk factors have not been available at landscape scales. Light detection and ranging (LiDAR) is a laser-based remote sensing technology capable of providing accurate, fine-scale data on 3D topographic and vegetative structure over large areas. LiDAR has been used to measure many different vegetative characteristics in different ecosystems, and LiDAR is increasingly being incorporated into forestry and wildlife research and management. My research uses LiDAR data to improve understanding of American marten (*Martes americana*) habitat quality. The specific objectives of my dissertation project were to 1) evaluate the ability of LiDAR to measure structural characteristics that serve as habitat resources for martens, and 2) use LiDAR and other data to understand the role of habitat structure, home range characteristics, and landscape features on mortality risk. We acquired high-density (8 pulses/m2) LiDAR data in 2014 and measured fine-scale habitat characteristics at 189 field plots from 2015-2016. LiDAR and field data were used to determine whether LiDAR could be used to measure habitat characteristics. We radio-collared 242 martens from 2008-2015. Radio-collared martens were killed by predators such as bobcats, fishers, foxes, wolves, and raptors, but bobcats were responsible for most predation events. We used sites where martens were killed by predators and LiDAR data to test how habitat structure influenced bobcat-marten interactions. Our results demonstrate the potential of LiDAR data to improve understanding of habitat quality and also highlight some of the challenges associated with incorporating LiDAR into wildlife habitat research and management.