**Evaluating the roles of climate, snowpack, and cavity microclimate on American marten winter rest site selection across the Western Great Lakes Region**

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Mammals use morphological, physiological, and behavioral adaptations to survive, especially in northern latitudes where winter conditions can be severe. Winter rest site selection is a key component of the behavioral thermoregulatory strategy of American martens (*Martes americana*). Throughout most of North America, martens seek thermal refuge in the subnivium, a microhabitat at the snow-soil interface that can provide warmer, more stable temperatures than the ambient air throughout the winter. With declines in the extent, duration, and depth of snow cover over the last 50 years, martens may lose access to subnivean rest sites in areas where the snowpack is deteriorating and be forced to select alternative microhabitats that provide less thermal protection. In areas lacking a snowpack, tree cavities may be important alternatives. For example, martens in Michigan’s northern Lower Peninsula primarily rest in tree cavities during winter. Whether tree cavities provide the same thermal benefit as the subnivium is not known. In this study we evaluated how differences in climate, snowpack, and tree cavity characteristics influenced winter rest site selection by martens across the Western Great Lakes Region. Our objectives were to: 1) develop and test a thermal model to predict cavity temperature based on ambient conditions and physical characteristics of cavities that affect heat transfer, and 2) use empirical data and predictive models to understand factors influencing marten rest site selection. The cavity thermal model was based on theoretical heat transfer equations. We deployed temperature loggers in 43 natural cavities used by martens, and 27 artificial cavities across two study areas to collect empirical data to test our cavity thermal model. Validation of the model showed that it could accurately predict cavity temperatures qin both natural and artificial cavities. To understand marten winter rest site selection, we compared the thermal environments of subnivium and tree cavity rest sites used by martens in two study areas: the Manistee National Forest in the lower peninsula of Michigan, where there is relatively little snowpack and martens primarily rest in tree cavities during the winter; and the Superior National Forest in northeastern Minnesota, where the snowpack is deep and martens primarily rest under the snow during the winter. We found that in Minnesota, martens used subnivean rest sites more frequently than expected based on climate alone. Similarly, martens in Michigan used tree cavities more frequently than expected based on climate. Surprisingly, we found that cavities can provide energetically favorable microclimates in certain conditions that are common in the Michigan study area. These results suggest that as climates warm and snowpack continues to deteriorate, martens may not experience higher energetic costs when resting in tree cavities during the winter. Further, our results suggest that resting behavior in both study areas may be driven in part by availability of thermally protective resting structures