

Evaluating Spatiotemporal Interactions between Winter Recreation and Wildlife Using Agent-Based Simulation Modeling on the Kenai Peninsula, Alaska

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Introduction

Concern has been expressed throughout North America regarding the potential for dispersed winter recreation activity, such as snowmobiling and helicopter skiing, to disturb wildlife species. Such disturbance occurs at a time when many animals have increased costs of mobility and decreased availability of forage resources, and may be especially detrimental to wildlife populations. At the same time, winter sports enthusiasts are increasing in number and dispersing great distances into natural areas. Throughout the Kenai Peninsula, Alaska, the most extensive dispersed recreation occurs in terrestrial habitats during winter (approximately December through April). Land within this area is managed almost exclusively by the Chugach National Forest (CNF). Dispersed winter recreational activities (e.g. snowmobile riding, heli-skiing, cross-country skiing, alpine skiing, snowboarding, and snow-shoeing) occur when deep snow and frozen bodies of water allow easier access to backcountry areas. Snowmobiles travel dozens of miles into the backcountry from road access points along the Seward and Sterling Highways. Additionally, aircraft supported activities now provide winter access to a number of remote locations. While some data have been collected at a few discrete locations that serve as access points for winter recre-

ation opportunities (e.g. parking lots), it is doubtful whether these data can be extrapolated to spatial scales meaningful for managing or evaluating potential impacts from dispersed winter recreation. While winter can be a stressful season for wildlife if forage resources or quality of thermal cover are reduced, these snow conditions may also restrict movement between habitat patches, increase movement costs and diminish the probability of escape from predators. This paper describes a novel technique to quantify the spatiotemporal intensity of human overlap with wildlife on winter landscapes. Recreation Behavior Simulator (RBSim) was used to model the spatiotemporal distribution of dispersed winter recreationists on the Kenai Peninsula and Upper Turnagain Arm area of Alaska. Simulation results were used to measure overlap with habitat for denning grizzly bears and mountain goats.

Methods

Flight survey efforts completed during 1995-1996 estimated five wolverines per 100 km² for the Kenai Peninsula. Subsequent flight surveys, completed during April of 2004 documented wolverine presence throughout much of the KPT but results are neither spatially nor temporally explicit enough

to describe species distribution relative to winter recreation. Aside from mapping wildlife presence in KPT, spatial patterns of dispersed winter recreation also mapped using aerial surveys during the winters of 2004 and 2005. Data were collected by systematic aerial survey of 60 sub-watershed sample units, ranging from 40 to 160 km² in size. A stratified random selection of sample units and complete area search techniques were used. Pathways and destinations used by winter recreationists and locations of individual recreation parties (snowmobile, pedestrian, and aircraft supported) were mapped by user type. Survey flights occurred on randomly selected days, stratified by weekend vs. weekday, between mid-January and mid-April of 2004 and 2005. In addition, vehicle counts of the 42 plowed parking lots along the Seward highway system between Girdwood and Seward were conducted between mid-January and mid-April of 2004 and 2005. Each count enumerated the total number of vehicles and trailers per parking lot. Two hundred and seventy-eight recreation user interviews were conducted at 42 parking lots along the Seward and Sterling Highway corridor between Girdwood and Seward, Alaska. Surveys were conducted during three, 30-day periods beginning in mid-January and continuing through mid-April, 2005. Survey days and locations were selected by stratified random sample.

Results

Using the aerial surveys, questionnaires and parking lot counts a model was developed to simulate the spatial and temporal distributions of winter recreationists in the Kenai Peninsula and Upper Turnagain Arm area (KPT) using RBSim (Itami 2003). Though RBSim has routinely been used to evaluate spatiotemporal patterns of recreation use along linear trail networks and their associated recreation facilities (Gimblett 2002) few attempts have been made to characterize recreation use of areal features at the landscape scale. Through the application of RBSim, the temporal nature of dispersed recreation is integrated with spatial pathways used by winter recreationists. Resulting distributions are compared to the spatial descriptions of habitats used by mountain goats, grizzly bears and wolves. This paper demonstrates the application of

RBSim for predicting the spatial distribution and intensity of winter recreation in an individual watershed within the KPT. It is hoped that the techniques used can be employed to evaluate winter recreation throughout the study area.

References

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