

Winter Habitat use by Mountain Goat in Kenai Peninsula, Alaska

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Introduction

Mountain goats (*Oreamnos americanus*) are highly valued by Alaskans and visitors for both consumptive and non-consumptive purposes. The Chugach National Forest in Alaska manages mountain goat habitat and works with the Alaska Department of Fish and Game to monitor their numbers on the Kenai Peninsula. These agencies developed a collaborative research project to collect information for the purpose of meeting their mountain goat management objectives of maintaining suitable habitat and sustaining healthy populations.



Study Area and Data Used

Study Area

Kenai Peninsula, Alaska

Data

Location data from GPS Collared Mountain Goats

GPS locations of 5 mountain goats during winter period of 2007

Landscape characteristics from various GIS layers

Elevation, Distance from escape terrain, aspect, VRM, Rock, Shrub



Figure 1: Study area shown by yellow boarder

Methodology

Scope of Analysis

Minimum convex polygon for the location of each goat

Cell size of 60m×60m for each polygon

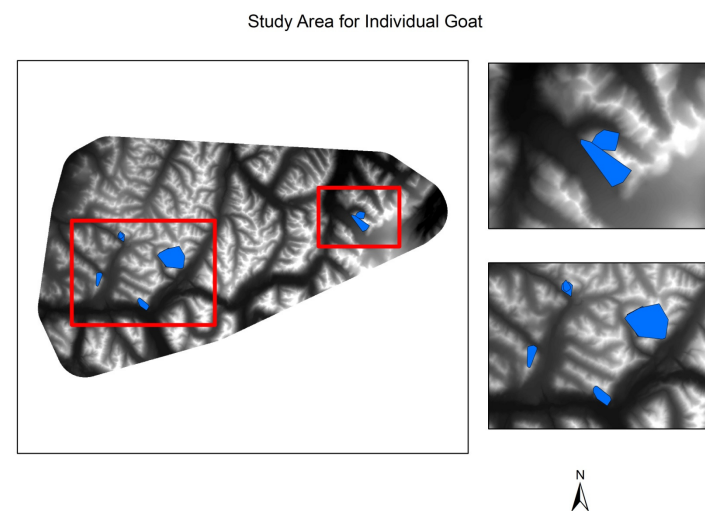


Figure 2: Minimum Convex Polygon denoted by blue area for each goat

Methods of Analysis

Negative Binomial Regression and Discrete Choice Model

Negative binomial model accounts for number of times a goat appears in a particular cell

Discrete Choice model incorporates the distance travelled by a goat from one cell to another

Model Estimation

Negative Binomial Regression

$$f(\lambda) = \ln(\lambda) = \beta x$$

where,

$$\Pr(y|x) = \frac{\Gamma(y + \alpha^{-1})}{y! \Gamma(\alpha^{-1})} \left(\frac{\alpha^{-1}}{\alpha^{-1} + \lambda} \right)^{\alpha^{-1}} \left(\frac{\lambda}{\alpha^{-1} + \lambda} \right)^y$$

Discrete Choice Model

$$\Pr(y|x) = \frac{\exp(\beta x)}{\sum \exp(\beta x)}$$

Results and Discussion

Table 1 shows the regression coefficients from Discrete Choice (DC) and Negative Binomial (NB) models

Table 1: Coefficient Estimates of a single goat

	DC Model	NB Model
Constant		-7.898*** (1.807)
Distance	-0.024*** (0.0004)	
DistEsc	-0.029*** (0.005)	-0.046*** (0.003)
Elevation	15.238*** (4.225)	9.622** (3.312)
ElevationSq	-5.447** (1.927)	-4.214* (1.509)
VRM	0.042* (0.017)	0.145*** (0.031)
Aspect	-0.486*** (0.068)	-0.856*** (0.080)
Shrub	0.177 (0.146)	1.009*** (0.251)
Rock	0.302 (0.168)	1.082*** (0.255)
Log-Likelihood	-5866	-1357
AIC	11748	2730
N	2128	5541

St. errors in paranthesis

Significance codes: 0.001 **** 0.01 *** 0.05 ** *

Suitable Habitat for Mountain Goat

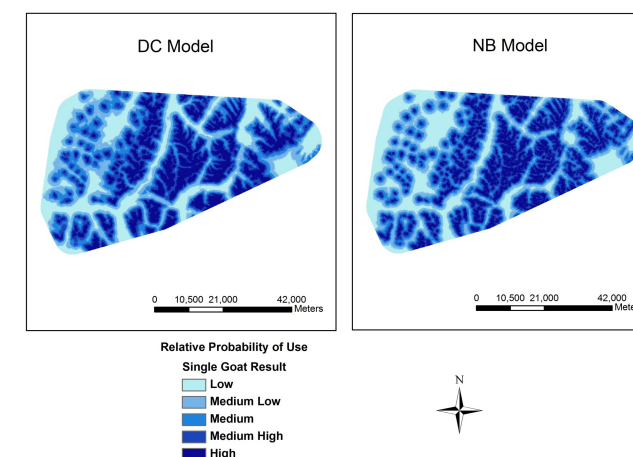


Figure 3: Suitable winter habitat for mountain goat, based on result of single goat from Table 1

Conclusion

Both DC and NB model predicts well the winter habitat use by mountain goat in the Kenai Peninsula.

Based on the probability of use higher than 0.8, DC and NB models predict 93 and 86 percent for a goat, and 81 and 62 percent of the entire goat locations based on the output of a single goat model.

Managers at Chugach National forest are believed to benefit from the output of this study in conserving the mountain goat habitat.

Mountain Goats prefer
intermediate elevation
to live close to escape terrain (high slope) to avoid predation
southerly aspect
more rugged terrain
shrub (as a measure of forage availability)
rock

Selected Literature

- Harris, G.M., Russell, G.J, van Aarde, R.I., and Pimm, S.L. 2008. Rules of habitat use by elephants *Loxodonta africana* in southern Africa: insights for regional management. *Oryx*, 42(1).
- Manly, B.F., McDonald, L., D. Thomas, T. McDonald, and W.Erickson. 2002. Resource selection by animals: statistical design and analysis for field studies. Second edition. Kluwer Academic Publishers, Boston, MA, USA.
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