Wolverine Habitat Suitability Index in Tatshenshini-Alsek Provincial Park, British Columbia

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2013

PROBLEM STATEMENT

My project focuses on Tatshenshini-Alsek Provincial Park, located in NW British Columbia, to model the regions of preferential habitat for the blue-listed (BDCDC) wolverine (*Gulo gulo*) in a natural, relatively undisturbed landscape. Most existing habitat suitability indices (HSI) for wolverine were conducted with the goal of determining available habitat in the face of anthropogenic disturbance and development. My project will utilize Landuse classification, Terrain ruggedness and Proximity to roads to model their preferred habitat in an area free of development and with little human activity.

STUDY AREA

Tatshenshini-Alsek Provincial Park covers approximately 1 million hectares and is located in the extreme northwestern corner of British Columbia (Figure 1). It is bordered to the north by Yukon and the west and south by Alaska, USA. Combined with adjacent parks within Yukon and Alaska, the region surrounding Tatshenshini-Alsek makes up the largest protected area in the world, totally 8.5 million hectares.

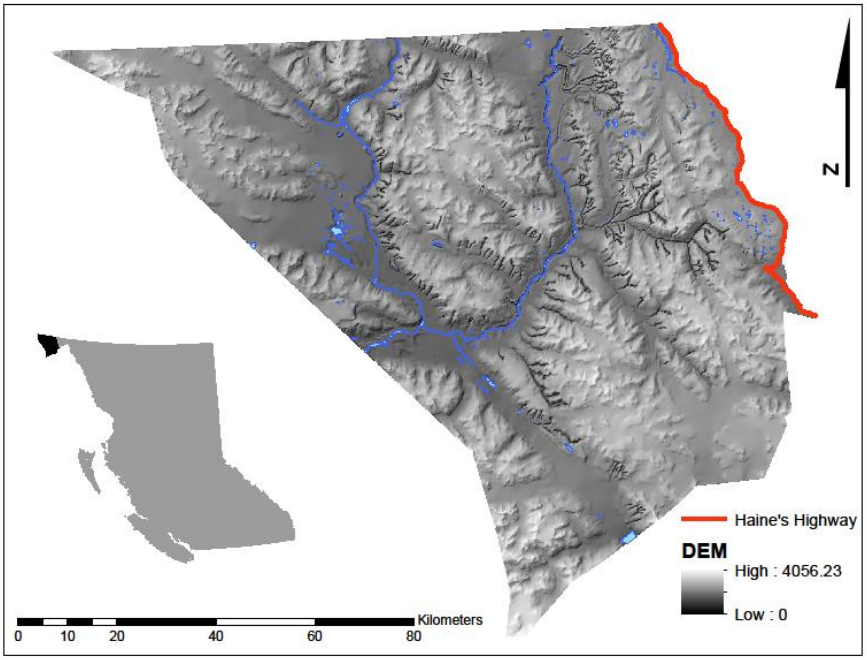

Figure 1. Location of Tatshenshini-Alsek Provincial Park in northwestern British Columbia, depicting the only road which traverses the eastern edge.

DATA SOURCES

Data for this project was collected through online sources and existing data in the UNBC GEOG 413 collection (Table 1). Vector Ruggedness Measure (VRM) information was established through Sapplington's (2007) publication, with Python script written by Sapplinton being downloaded from Arcscripts.

Table 1. Sources for all data used during GEOG 413 HSI project.

Data	Source
Park Boundary	Course folder (GEOG 413)
Landuse	Course folder (GEOG 413)
BC Boundary	Course folder (GEOG 413)
NTS 250k	Geogratis.ca
Vector Measure Ruggedness Script	Arcscripts (Sappington 2008)

METHODS AND CRITERIA

Habitat classification was conducted after review of wolverine and mustelidae distribution and habitat predictability publications (Lofroth and Krebs 2007, Krebs et al. 2007). Publications also provided guidelines for the creation of values and weights for all factors necessary for the final output (Table 2).

Table 2. Scoring and weighting for all factors utilized in HSI analysis.

Factor	Class	Value	Weight
Landuse	Barren Surfaces	0	50%
	Fresh Water	0	
	Glaciers & Snow	0	
	Mining	0	
	Old Forest	1	
	Wetlands	3	
	Alpine	4	
	Recently Logged	4	
	Shrubs	4	
	Young Forest	6	
	Sub Alpine Avalanche Chutes	10	
Ruggedness	0 - 0.2	0	30%
	0.2 - 0.4	1	
	0.4 - 0.6	3	
	0.6 - 0.8	6	
	0.8 - 1.0	10	
Proximity to Road (Kms)	0 - 20	0	20%
	20 - 25	1	
	25 - 50	2	
	50+	3	

Landuse data was examined through existing landscape classification where areas of higher use were determined to be selected by wolverine as a result of higher prey and lower predator densities. The one highway that borders the eastern boundary of the park was utilized by the euclidean distance tool so higher values could be assignment further from the road, as research shows wolverine activity to increase with an increased distance from roads (Krebs et al. 2007).

Terrain ruggedness was established through a VRM script in Python. This script utilized three dimensional components of the slope and aspect of each cell, which then calculates a 3x3 neighbourhood analysis to determine ruggedness of each cell as a relation between all adjacent cells (Figure 2).

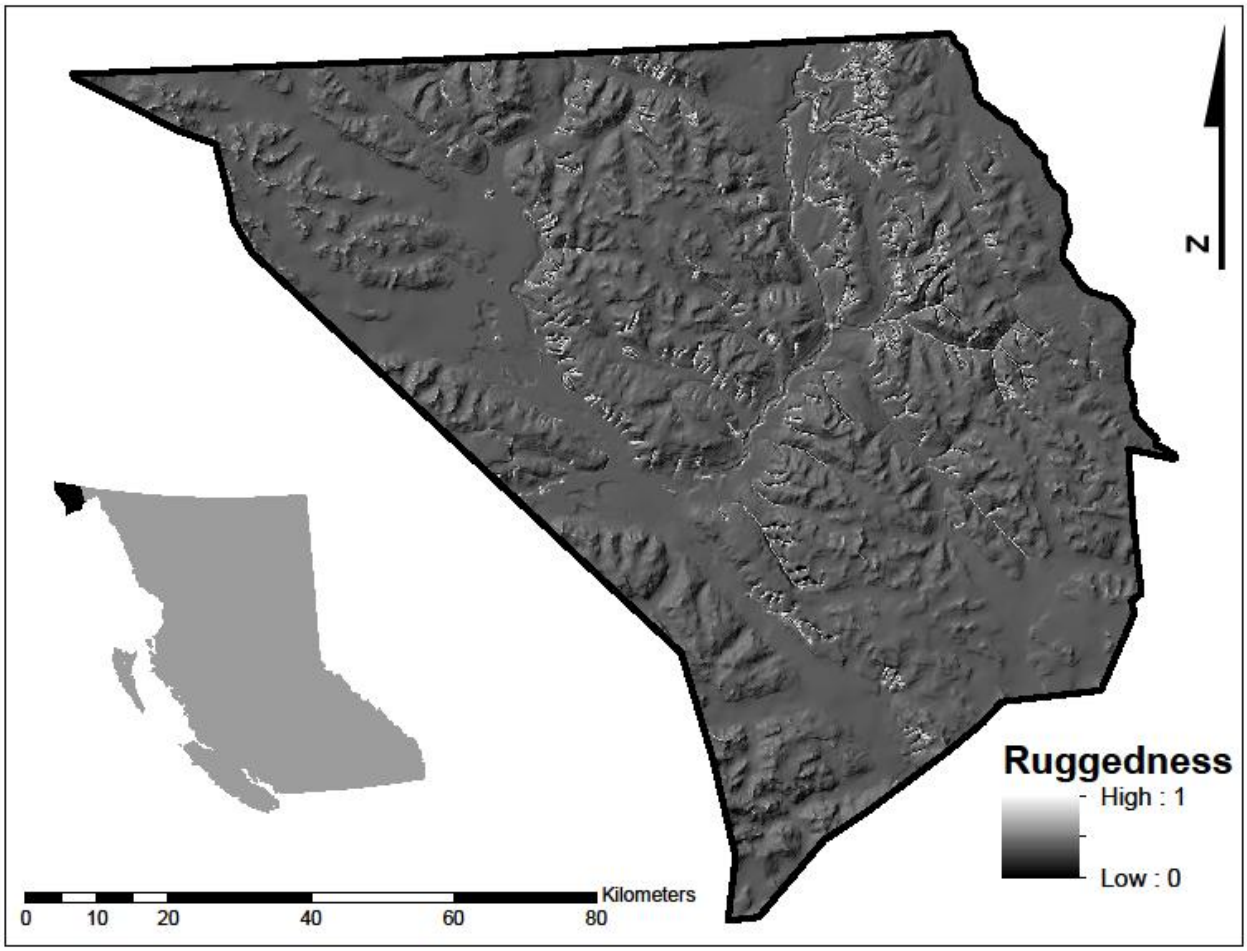

Figure 2. Terrain ruggedness displayed for Tatshenshini-Alsek Provincial Park, located in northwestern British Columbia.

With three layers created (ruggedness, proximity to road and landuse classification), each was reclassified and values were assigned to all categories (Table 2), higher numbers to those selected by wolverine. Raster Calculator was then used to multiply each by their assigned weight and sum the three, with the output raster being the wolverine HSI for Tatshenshini-Alsek Provincial Park.

RESULTS

The output for terrain ruggedness shows only small areas meeting the criteria for high ruggedness (Figure 2). The final Habitat Suitability Index output for wolverine in Tatshenshini-Alsek Provincial Park shows regions near river valleys to be the most preferred (Figure 3).

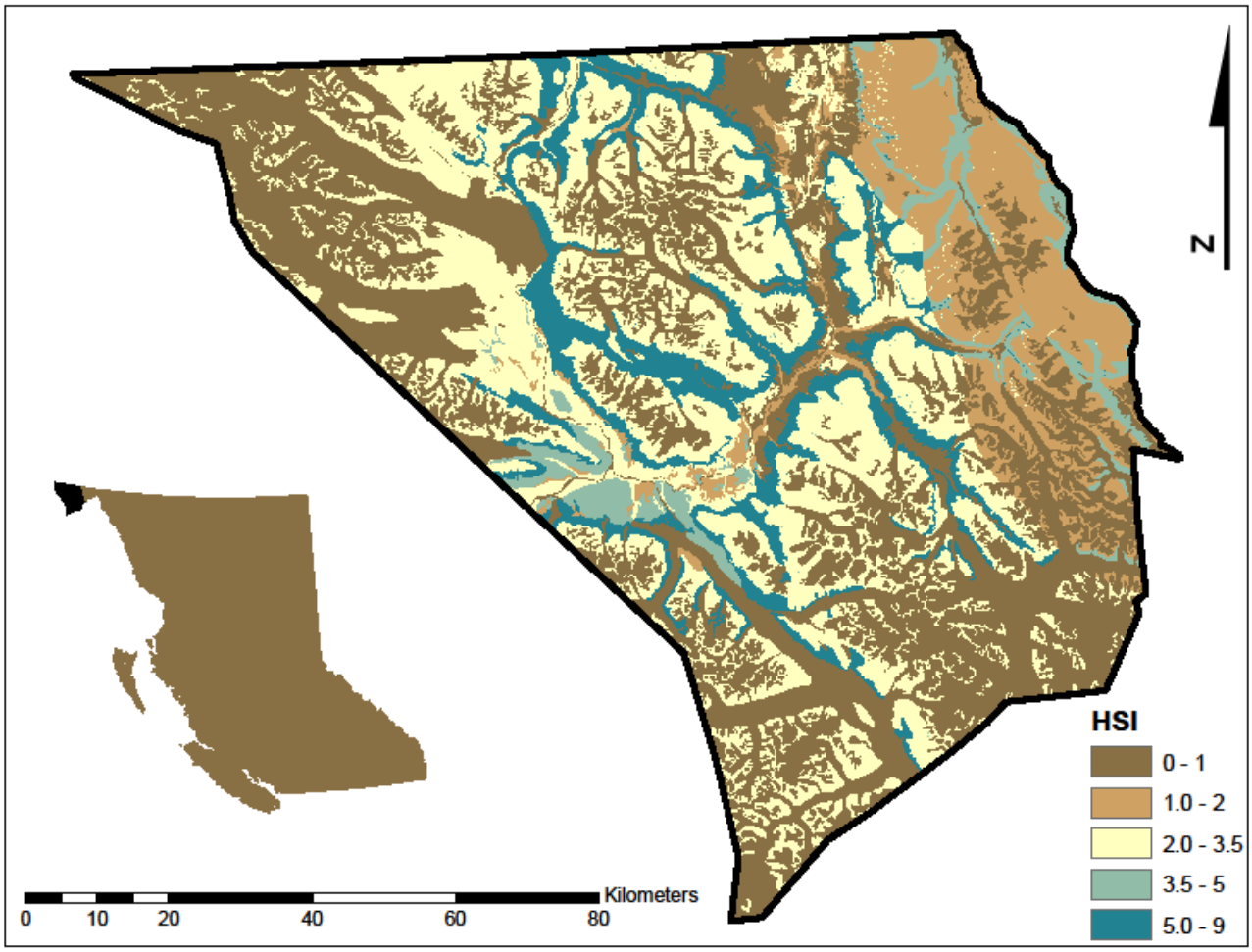

Figure 3. Habitat Suitability Index for wolverine with Tatshenshini-Alsek Provincial park, located in northwestern British Columbia.

DISCUSSION

With human development and disturbance on the rise, it is important to realize how species function in their natural environment. This will provide baseline data for conservation efforts or restoration activities. The wolverine is a species that is highly affected by human presence and disturbance (Copeland et al. 2007), so further information can only help counter future declines.

The HSI clearly depicts an association with my parameters and lower elevation, river valley slopes (Figure 3). A major limitation of this project is the lack of prey species distribution and habitat preference. Wolverine distribution has been found to relate quite strongly with the presence of both predators and prey distributions (Lofroth and Krebs 2007), and limitations on available data, knowledge, and time constraints did not allow prey and predator distribution to be factored into the final HSI.

In addition to the inclusion of predator and prey distributions as factors in the production of the HSI, extensive research should be conducted to establish the most accurate model. These models are an excellent visual, however their relevance can only go as far as the expertise that went into creating the parameters. A comprehensive and precise HSI should be conducted by an expert on the given species, but to increase even further, they should be familiar with the exact population in question.

LITERATURE CITED

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