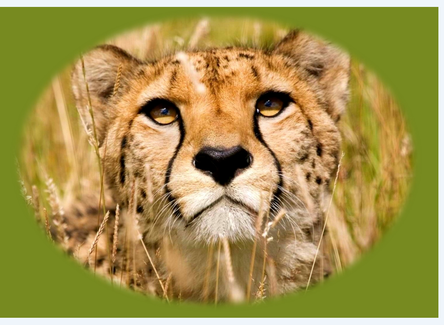
Outrunning Extinction?

Habitat Suitability Analysis for the Critically Endangered Asiatic Cheetah in Iran

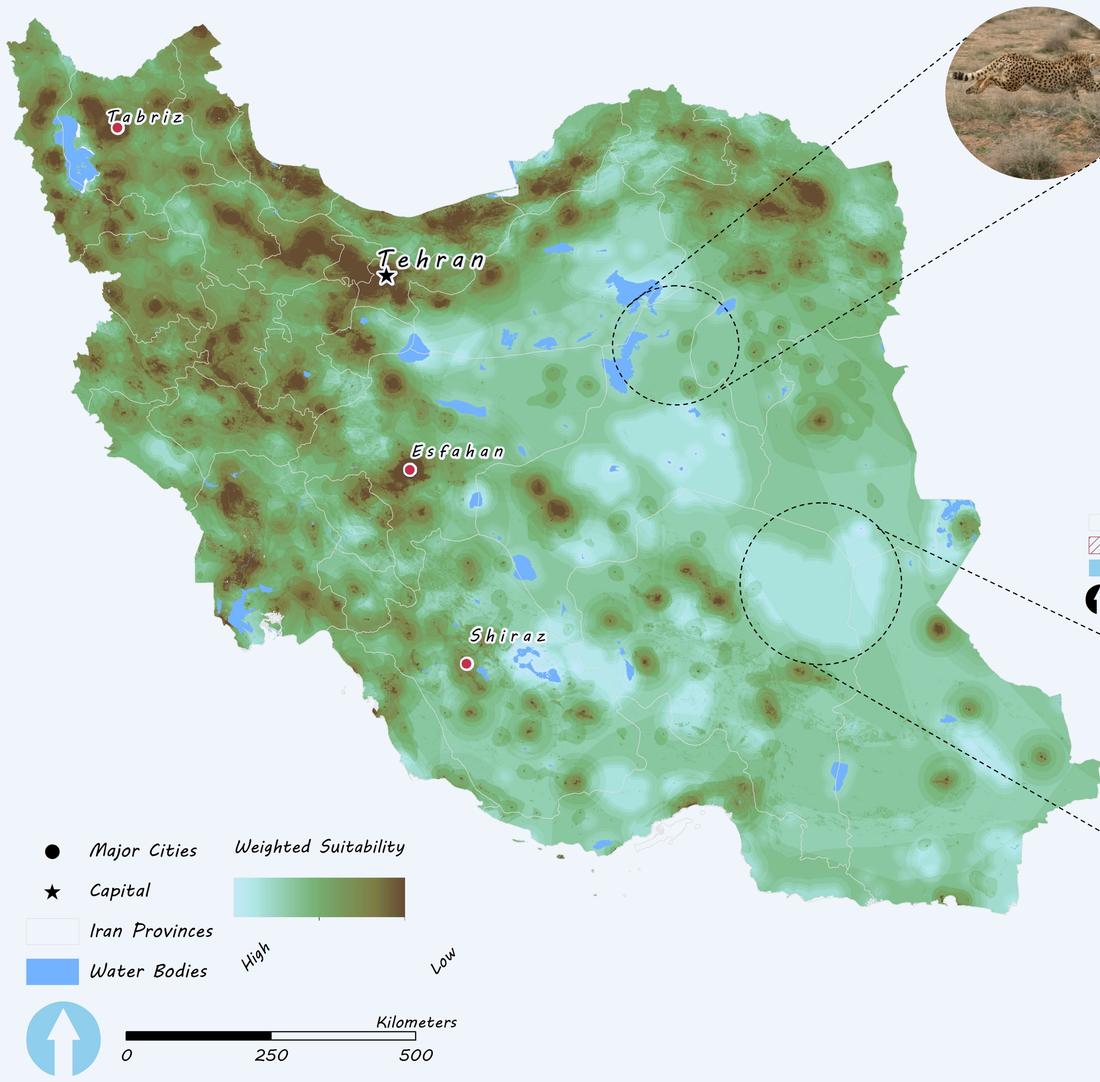


Cheetahs in Iran?

Yes! Historically, cheetahs had an original range extended throughout Africa, the Middle East, Central Asia and even into India. Currently the last remaining population of Asiatic cheetahs (*Acinonyx jubatus venaticus*) resides in a small portion of the Islamic Republic of Iran. The Asiatic cheetah is genetically distinct from its well-known African relative and has a few morphological differences including being slightly smaller. The Asiatic cheetah is listed as a critically endangered species on the IUCN red list, with fewer than 50 individuals left and quickly racing towards extinction. Conservation efforts were limited due to government instability during the Iran-Iraq war in 1980. Their current range is in three distinct pockets of eastern Iran and they face a multitude of threats including road collisions, habitat loss, and poaching. In 2001 Iran's Department of the Environment started an initiative called "Conservation of the Asiatic Cheetah, its Natural habitat, and associated Biota in the Islamic Republic of Iran" in an effort to spearhead conservation. The purpose of this analysis is to investigate areas with suitable habitat for Asiatic cheetahs throughout Iran, identifying key locations that could be used to reintroduce, expand, protect, or connect habitat for the remaining population.

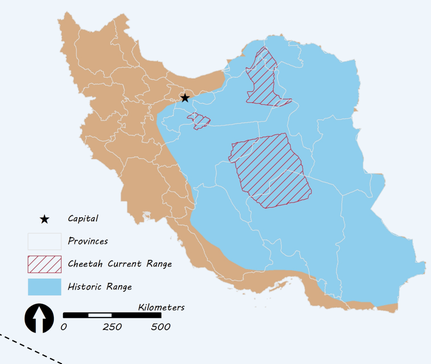
Methods

A habitat suitability analysis was performed by identifying important factors for Asiatic cheetah habitat. Spatial analyst tools were used to calculate these factors and reclassify each one according to its importance for cheetah habitat and conservation. The criteria used for the weighted suitability analysis and reclassification are listed in the table. The maps pictured below show areas that are of high suitability (5) to low suitability (1) for each of the included elements.



This area, located in Yazd Province, has a high suitability score and is located between the two largest current range areas for Asiatic cheetahs. This would be a possible location for a wildlife corridor to connect these two core populations.

Current & Historic Asiatic Cheetah



This is the largest area with an extremely high suitability score. Its is also adjacent to a current range area and thus should be considered as an important area to extend their habitat.

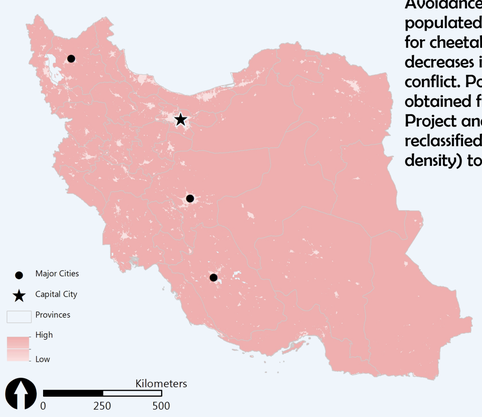
Factors	Population Density (Per Km²)	Land Cover	Distance to Protected Areas	Kernel Density of Roads (Per Km²)	Distance to Urban Areas	Prey Availability	Distance to Railways	Kernel Density of Conflict Zones (Per Km²)	Distance to Water Source
Weight	15%	20%	10%	20%	10%	10%	5%	5%	5%
Extremely Low Suitability (Suitability Score 1)	60 -103	Snow/Ice, Urban and Built Up	>30 km	15.5	0 -10 km	Area has one prey species	0 - 5 km	0.1198	>20 km
Low Suitability (Suitability Score 2)	30 - 60	Permanent Wetlands	20 - 30 km	4.5	10 - 25 km	Area has two prey species	5 - 15 km	0.0562	15 - 20 km
Average Suitability (Suitability Score 3)	10-30	Mixed, Deciduous Broadleaf, Evergreen broadleaf, and Evergreen Needle leaf forests	15 - 20 km	1.5	25 - 40 km	Area has three prey species	15 - 25 km	0.0216	10 -15 km
High Suitability (Suitability Score 4)	2-10	Croplands, woody savanna	10 - 15 km	0.5	40 - 50 km	Area has all four prey species	25 - 35 km	0.0061	5 - 10 km
Extremely High Suitability (Suitability Score 5)	0-2	Open Shrub lands, closed shrublands, savannas, sparse vegetation	0 - 10 km	0.25	>50 km	Area has all four prey species (with secure distribution)	>35 km	0.0024	0 - 5 km

Suitable Spots

The final suitability analysis indicates that there are two main areas, and multiple smaller ones with extremely high suitability for Asiatic cheetahs dispersed throughout Iran. The largest suitable area is located at the intersection of three provinces in southeast Iran, these are the provinces of Kerman, South Kharasan, and Sistan and Baluchestan. This habitat is also located adjacent to a current habitat range making it an ideal location to propose a protected area. There is sufficient areas that have ranked between high and average suitability throughout the south eastern portion of the country. However, much of this area is interspersed with extremely low suitability areas with dense population, conflict, roads, inadequate prey, incorrect land cover, and far from protected areas. Within these regions a future application would be to further investigate areas of high suitability that are intersected with barriers such as roads. This would give a good indication of possible places for wildlife crossings to be made. This would be especially crucial because road deaths are a major cause of decline for Asiatic cheetahs. Connecting habitat would also allow for increased genetic flow between subpopulations promoting viability for the future.

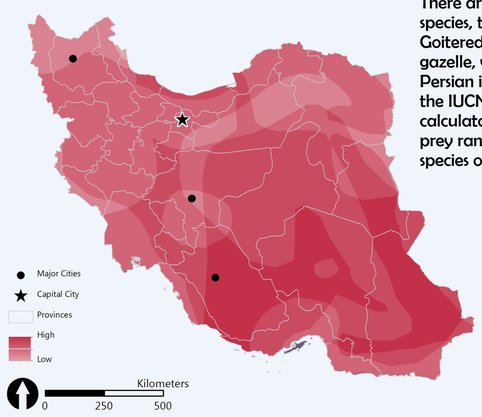
Factor Analysis

Population Density



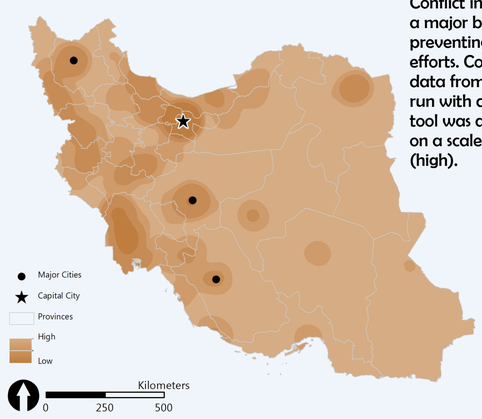
Avoidance of highly populated areas is important for cheetah conservation as it decreases instances of human conflict. Population data was obtained from the World Pop Project and data was reclassified on a scale of 1 (high density) to 5 (low density).

Prey Availability



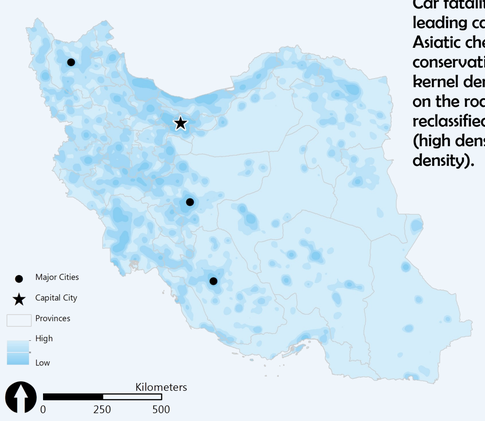
There are 4 important prey species, these include the Goitered gazelle, Jebeer gazelle, wild sheep, and Persian ibex. Prey data from the IUCN and raster calculator was used to find prey ranges where 1,2,3, or 4 species of prey are available.

Density of Human Conflict



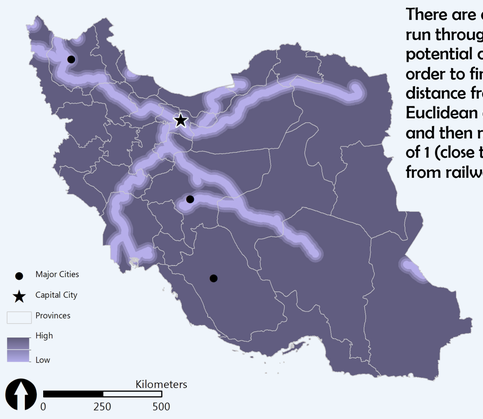
Conflict in Iran has been a major barrier preventing conservation efforts. Conflict event data from ACLED was run with a kernel density tool was and reclassified on a scale of 1 (low) to 5 (high).

Density of Roads



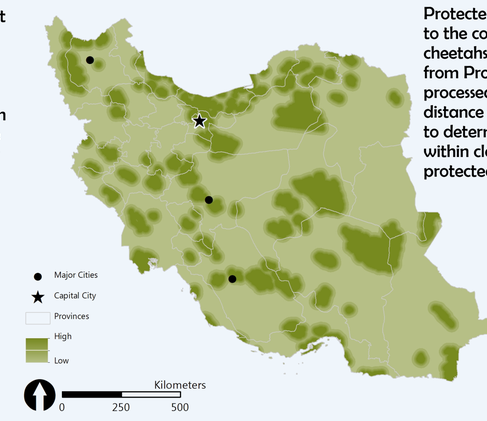
Car fatalities are one of the leading causes of death for Asiatic cheetahs and a major conservation concern. A kernel density tool was run on the road data and then reclassified on a scale of 1 (high density) to 5 (low density).

Distance to Railroads



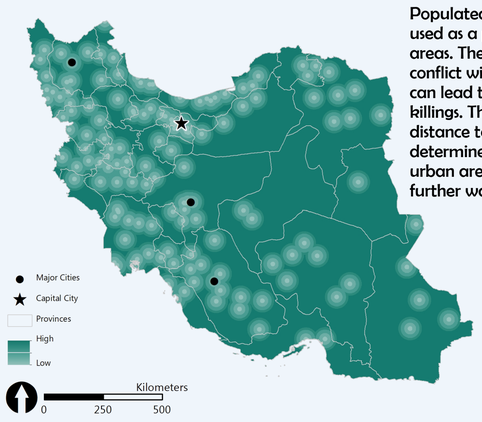
There are a main railroads that run through Iran intersecting potential cheetah habitat. In order to find areas in a proper distance from these railways, Euclidean distance tool was run and then reclassified on a scale of 1 (close to railways) to 5 (far from railways).

Distance to Protected Areas



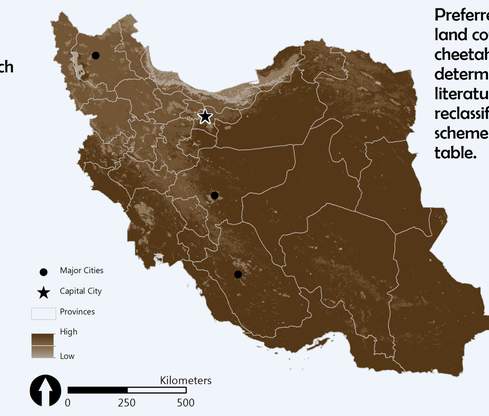
Protected areas are pertinent to the conservation of Asiatic cheetahs. Data was obtained from Protected Planet and processed with a Euclidean distance tool and reclassified to determine suitable habitat within close proximity to protected areas.

Distance to Urban Areas



Populated places were used as a proxy for urban areas. There is human conflict with cheetahs which can lead to retaliatory killings. The Euclidean distance tool was run to determine areas close to urban areas and areas further way.

Land Use



Preferred habitat and land cover for Asiatic cheetahs was determined from the literature and reclassified using the scheme shown in the table.

Aleta Dam
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MCM 591 GIS for Conservation Medicine

Projection: ED 1950 Iraq National Grid | Transverse Mercator

Data Sources: Global Administrative Area (GADM), International Union for Conservation of Nature (IUCN), WorldPop, Protected Planet, The Armed Conflict Location and Event Data Project (ACLED), Humanitarian Open Street Map Team (HOTSM), Panthera, Global Land Cover, ESRI

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