Move It Or Lose It!

The Use of Suitability Analysis and Least Cost Path Modeling To Identify Movement Corridors for the San Joaquin Kit Fox

Introduction

The San Joaquin kit fox is a particular kit fox subspecies that is native to Southern and Central California. Prior to 1930, the San Joaquin kit fox inhabited a greater part of the San Joaquin valley. Since then, intensive agricultural and urban development has severely fragmented the fox's habitat. Maintaining habitat connectivity is crucial to the survival of a species because it allows for gene flow between populations in different habitat patches. As such, identifying movement corridors between suitable habitat patches will play a crucial role in San Joaquin kit fox conservation.

Using a combination of suitability analysis and least cost path modeling, this project attempts to answer to following research questions:

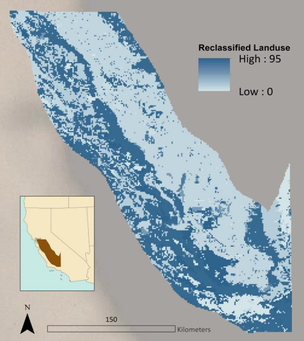
1. What areas in the San Joaquin Valley are suitable for kit fox habitat?
2. What are the likely routes that kit foxes take between patches of suitable habitat?
3. Do routes between suitable habitat patches, as well as the habitat patches themselves, occur in protected areas?

Methods

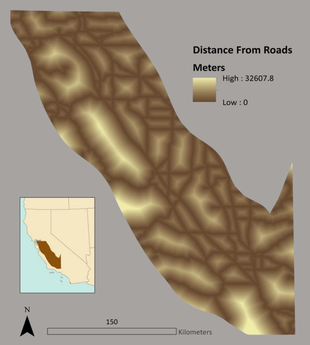
1. Reclassified suitability factors on a scale of 0—100
   - Highly suitable kit fox habitat has a slope of less than 5% , is more than 200m from a road, has a low road density, and occurs in grassland, chaparral, or scrub environments.
   - Highly unsuitable kit fox habitat has a slope greater than 15%, is within 200m of a road, has a road density that exceeds 0.578 km/km^2, and occurs in forested, lacustrine, urban, industrial, residential, or active agricultural environments.
2. Combined Reclassified layers in a weighted overlay
   - Landcover/Landuse 40%, Slope 20%, Road Density 20%, Distance from Roads 20%
3. Identified the most suitable patches of habitat using the Locate Regions tool
4. Used Cost Connectivity tool to calculate the optimum networks connecting suitable habitat regions in the San Joaquin kit fox's Northern and Southern Range
   - The cost surface for this step was created in Raster Calculator by subtracting the weighted overlay (habitat suitability map) from 100
5. Applied a 400m buffer (200m on each side) to the optimum networks to create movement corridors
6. Identified areas of conservation need by examining how the suitable habitat regions and movement corridors aligned with protected areas in California
   - Used the Erase tool to identify the portions of suitable habitat regions and movement corridors that do not overlap protected areas.

Suitability Factors

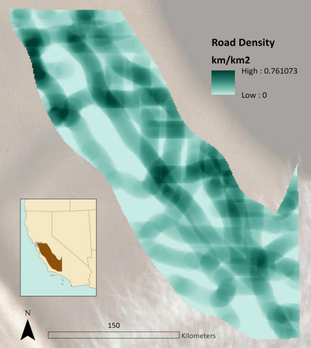
Landcover/Landuse



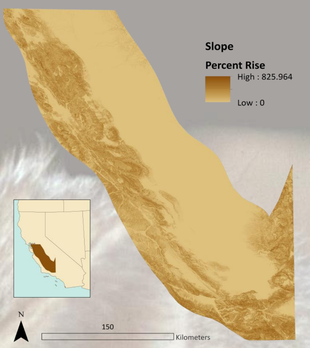
Distance From Roads



Road Density



Slope

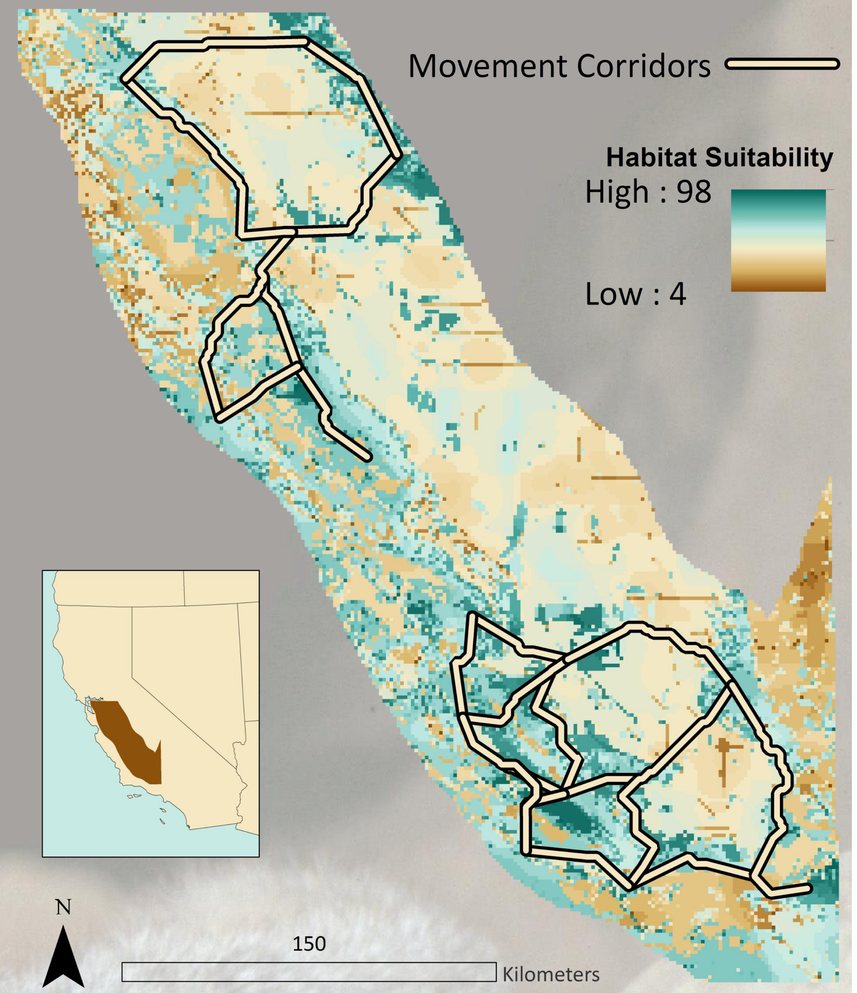


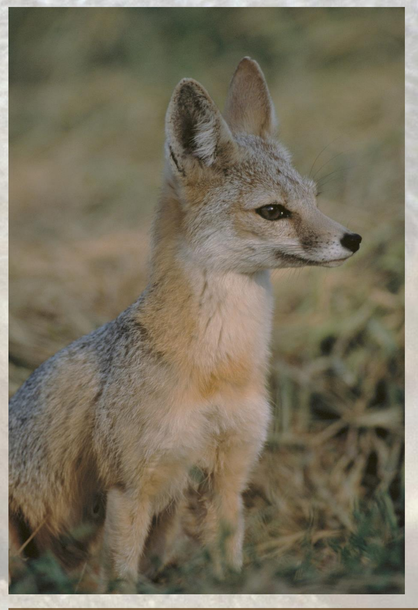
Results & Discussion

Based on the results , it appears that the San Joaquin kit fox is in urgent need of conservation action. With only 25.838% of the total area of habitat regions and 14.8% of the total area of movement corridors occurring on protected lands, the San Joaquin kit fox is vulnerable to future habitat loss. As such, I recommend that future conservation actions should be focused on preserving the 74.167% of suitable habitat regions and 85.200% of movement corridors that are unprotected.

Geographic Area	Area Unprotected (km^2)	Total Area (km^2)	Percent Unprotected (%)
Northern Regions	3,847.945	4,889.301	78.701
Southern Regions	3,904.816	5,564.544	70.173
Total	**7,752.761**	**10,453.845**	**74.162**

Geographic Area	Area Unprotected (km^2)	Total Area (km^2)	Percent Unprotected (%)
Northern Corridors	189.891	220.632	86.067
Southern Corridors	285.577	357.427	79.898
Total	**475.468**	**558.059**	**85.200**





Tufts UNIVERSITY

Cartographer: Rhémi Toth

Data Sources: IUCN, California State University Endangered Species Recovery Program, GAP Analysis Program (U.S.), U.S. Census Bureau Department of Commerce, USGS National Map

Projection: NAD 1983 (2011) California Teele Albers (meters)