Corridor Designer

A Suite of ArcGIS Tools to Identify and Evaluate Corridors Between Fragmented Habitat Blocks

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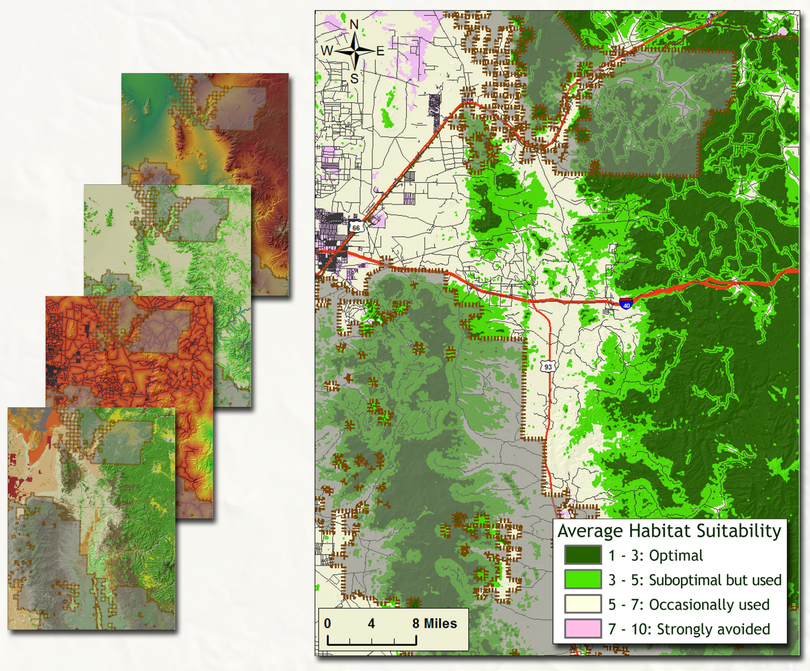
Tools, Manuals, Tutorials, Arizona Data and Literature available from www.corridordesign.org

Introduction

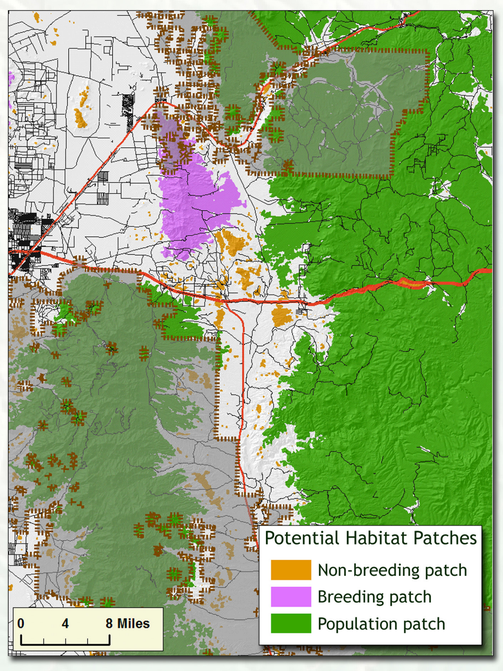
A wildlife corridor allows animals and plants to migrate and maintain gene flow, minimizes risk of vehicle-wildlife collisions and other human-wildlife conflicts, and promotes a sense of place for human communities. A team of ecologists and GIS analysts in the School of Forestry at Northern Arizona University have helped design over 20 wildlife corridors in Arizona and California. These science-based corridor designs for multiple species are being implemented by counties, federal and state land managers, state and federal transportation agencies, and conservation groups. The GIS tools used to develop these corridor designs are now available as CorridorDesigner, – a toolbox that any GIS-savvy user can use.

Identifying Corridors

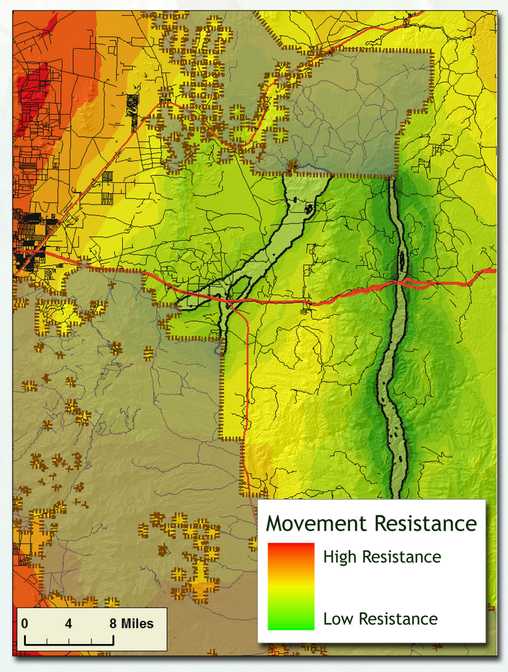
After completing the prerequisite non-GIS steps such as deciding what wildland blocks to connect and what focal species are expected to move between these wildland blocks, our suite of ArcToolbox tools allow the user to:



1. Create habitat suitability models by combining different GIS factors related to the habitat preferences of a species using a geometric or additive mean algorithm.



2. Divide the map of potential habitat suitability for a species into different habitat patch sizes, such as habitat patches large enough to support a breeding pair of a species (home range) and patches large enough to support a breeding population.



3. Create a corridor model between the wildland blocks for each species and select different-sized corridors.

For Arizona Users

The optional Arizona CorridorDesigner toolbox was designed to work in conjunction with the general CorridorDesigner toolbox to streamline the design of wildlife corridors within Arizona. The AZ toolbox includes habitat parameterizations for species throughout Arizona modeled for the Arizona Missing Linkages project, and must be used in conjunction with the land cover and elevation layers downloadable from http://www.corridordesign.org.

Mammals

- Antelope Jackrabbit (*Lepus alleni*)
- Arizona Gray Squirrel (*Sciurus arizonensis*)
- Badger (*Taxidea taxus*)
- Desert Bighorn Sheep (*Ovis Canadensis nelsoni*)
- Black Bear (*Ursus americanus*)
- Black-tailed Jackrabbit (*Lepus californicus*)
- Coues' White-tailed Deer (*Odocoileus virginianus couesi*)
- Elk (*Cervus elaphus*)
- Jaguar (*Panthera onca*)
- Javelina (*Tayassu tajacu*)
- Kit Fox (*Vulpes macrotis*)
- Mountain Lion (*Puma concolor*)
- Mule Deer (*Odocoileus hemionus*)
- Porcupine (*Erethizon dorsatum*)
- Pronghorn (*Antilocapra americana*)
- White-nosed Coati (*Nasua narica*)

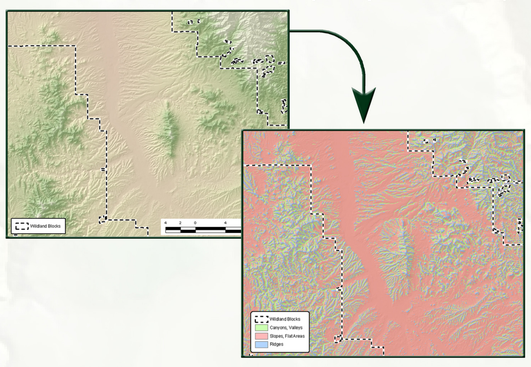
Amphibians and Reptiles

- Chiricahua Leopard Frog (*Rana chiricahuensis*)
- Desert Box Turtle (*Terrapene ornate luteola*)
- Sonoran Desert Tortoise (*Gopherus agassizii*)
- Gila Monster (*Heloderma suspectum*)
- Lowland Leopard Frog (*Rana yavapaiensis*)
- Giant Spotted Whiptail (*Aspidoscelis burti stictogrammus*)
- Lyre Snake (*Trimorphodon biscutatus*)
- Mexican Garter Snake (*Thamnophis eques megalops*)
- Sonoran Desert Toad (*Bufo alvarius*)
- Sonoran Whipsnake (*Masticophis bilineatus*)
- Tiger Rattlesnake (*Crotalus tigris*)
- Tucson Shovel-nosed Snake (*Chionactis occipitalis klauberi*)

The Land Facet Approach

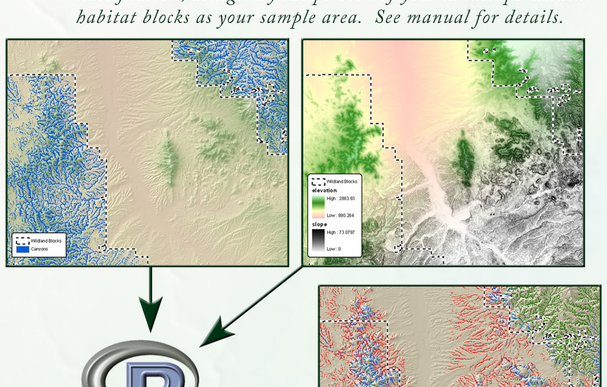
Land Facet Corridor Designer is a geographic approach to designing wildlife linkages that will be useful in the face of impending climate change. This novel GIS-based procedure identifies the geographic portion of a region that mimizes continuity and diversity of landscape units defined by topographic and soil traits (such as high-elevation north-facing slopes with rocky soils, or low-elevation flats with thick soils) that are expected to facilitate wildlife movement.

1 Initial Classification *using our Topographic Position Index (TPI) tool or any classification method you prefer*



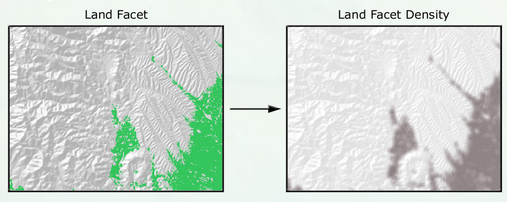
2 Define Land Facets for Each Class

Process should be repeated for each class from your initial classification, using only the portion of your landscape within habitat blocks as your sample area. See manual for details.

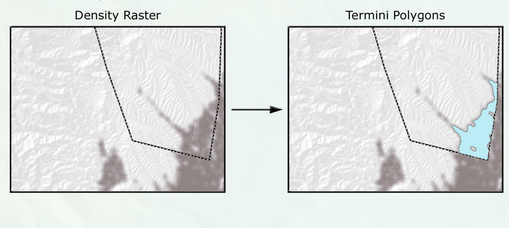


Note: *We provide several custom ArcGIS and R tools for this step. R is a powerful and free statistical software package.*

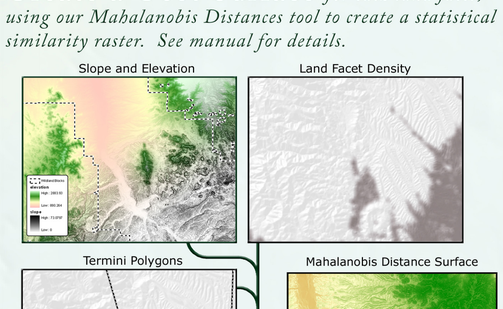
3 Define Density of Each Land Facet *using our Density tool.*



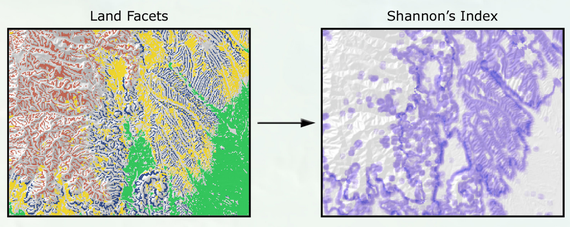
4 Identify Termini Polygons *for each land facet, using the "Density" raster and our Termini tool.*



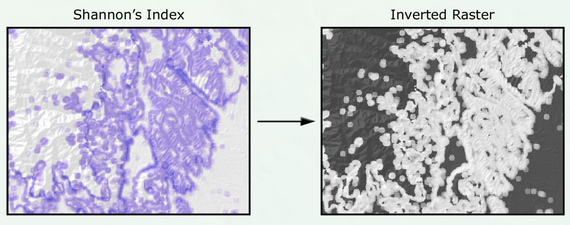
5 Create a Cost Surface *for each land facet, using our Mahalanobis Distances tool to create a statistical similarity raster. See manual for details.*



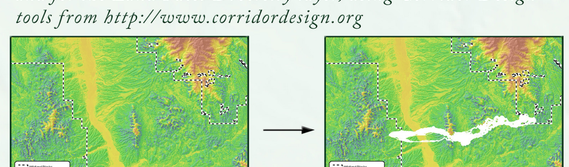
6 Create Land Facet Diversity Raster *using our Shannon's Index Tool. See manual for details.*



7 Invert the Diversity Raster *using our Raster Inversion tool. See manual for details.*



8 Create Corridor Polygons *for each land facet and for the Land Facet Diversity layer, using Corridor Design tools from http://www.corridordesign.org*



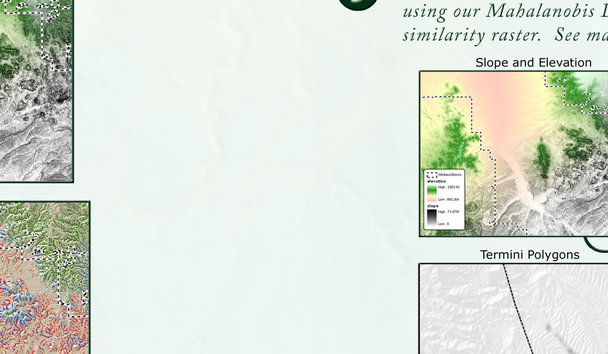
9 Combine All Corridor Polygons *into a single multi-stranded linkage design.*

Evaluating Corridors

The next step is to evaluate the biologically best corridor, as well as alternative corridors that may meet other management criteria. Our tools evaluate any corridor polygon using four general measures:

1. Maximum distance required to move from habitat patch to habitat patch, assuming all movement is constrained within the general corridor.

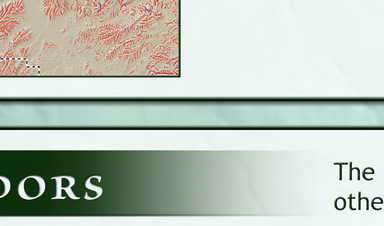
2. Bottleneck analysis, providing statistics on how constricted the corridor is and how much falls below a user-specified width threshold.



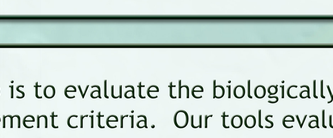
3. General statistics on any vector or raster background dataset.

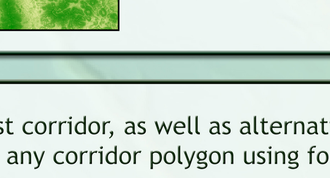
4. Spatially adjusted histograms and crosstabs.

Corridor Designer also includes several tools to quickly create and analyze alternative corridor polygons. These alternatives would naturally score lower in terms of habitat quality than the biologically "best" corridor, but the degree of difference can be useful when making management decisions.



Finally, Corridor Designer includes several ancillary tools to aid in general analysis, including functions to clip datasets and to convert graphics to shapefiles:





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