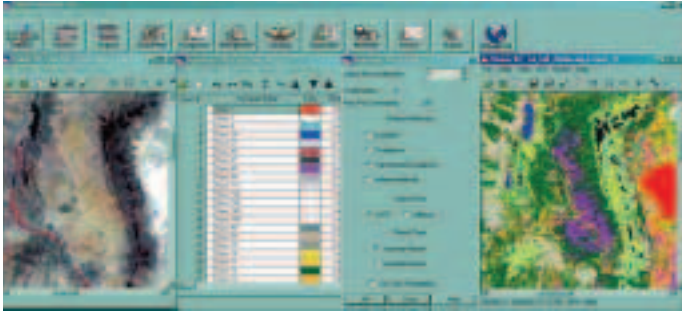


Geographic imaging helps endangered birds find a new home



The Transformed Divergence (TD) tool in ERDAS IMAGINE's Signature Editor tool was used to reduce the number of land cover classes produced from unsupervised classification to those with distinct spectral signatures. The distinct spectral signatures were then applied to the image to perform a supervised classification. Using this process, the number of spectral classes was reduced to 26 for the fall (wet season) image and 33 for the spring (dry season) image.

The Aplomado Falcon, once a common raptorial (predatory) bird in the coastal and interior grasslands of the American southwest, was declared an endangered species by the U.S. Fish and Wildlife Service in 1986. Increased sightings during the 1990s renewed recovery effort interests in New Mexico to evaluate the Chihuahuan Desert region that stretches from the Rio Grande Valley in southern New Mexico far into Mexico. A thriving ecosystem of other large birds and small prey is needed to sustain the Falcon's population because rather than building its own nests, it takes over the abandoned nests of other large birds. Researchers needed to better understand the Aplomado Falcon's natural history by describing falcon use areas in northern Chihuahua, Mexico. The GIS predictive modeling section was part of a five-year

Researchers at New Mexico State University (NMSU) have employed Leica Geosystems' remote sensing and GIS applications to evaluate the Chihuahuan Desert region in Mexico in order to identify habitat features most likely to sustain a population of the endangered Aplomado Falcon (*Falco femoralis*). The final products, a documented predictive model and a map depicting habitat suitability across a large portion of the species' range, are aiding in prioritizing areas for conservation consideration and making land use decisions that benefit falcon habitat restoration.

research endeavor that consisted of three phases. The first and second phases involved surveying the Aplomado Falcon habitat in Mexico's Chihuahuan Desert to locate and describe the physical features of the landscape where the birds exist. During the third phase, researchers analyzed satellite imagery as well as terrain data derived from digital elevation models (DEMs) of the Chihuahuan Desert to digitally locate the features identified as indicators of possible falcon habitat. The NMSU research results will help government agencies make informed decisions about the allocation of federal resources as well as environmental and development planning. Analyses were conducted using Leica Geosystems GIS & Mapping's ERDAS IMAGINE®, ESRI's ArcGIS and FRAGSTATS public domain software packages.

The three components were key to the project's success, as they produced the accurate results needed. ArcGIS interacted with both ERDAS IMAGINE (provided under an educational agreement) and FRAGSTATS applications; and ArcGIS was familiar to most end users of the final model, a critical factor in the project. To visually identify the land cover patterns that corresponded to those found in the Aplomado Falcon habitat, imagery was collected for spring and fall seasons that produce different vegetation responses found in the Chihuahuan Desert. The falcons require a combination of vegetation types: grasslands (for their prey base) with shrublands (where they perch and nest). Because of cloud cover conditions, each set of 15 LANDSAT 7 ETM+ data imagery was collected over a five-week span. ERDAS IMAGINE software was used to import, reconcile, and analyze the two sets of data images covering the study area of 246,848 km². After the multispectral data was imported, the digital values were converted to spectral reflectance values to describe the vegetation around the habitat. Using the histogram bias technique, the images were standardized to a single date for each season while maintaining the true shape and distribution of the data in the image. When both data sets were standardized

Falcon Facts:

Population: Extirpated in U.S., extremely rare and endangered throughout Northern Mexico and reduced to remnant population in Southern Mexico.



Range: Formerly ranged throughout the southwestern U.S. and Mexico. It has rarely been seen in the U.S. and northern Mexico since the 1940s.

Description: A medium-sized, steel grey falcon (aplmado is Spanish for dark grey). It is characterized by a long tail, a black cummerbund, contrasting with a white upper body. A distinguishing field characteristic of this falcon is the white dash above each eye and along the tailing edge of their secondary feathers.

Habitat: Open grasslands and savannahs where tall cacti, tree yuccas and taller pines and oaks grow in open stands. Uses old stick nests of hawks and other species which share the same range and habitat.

(each roughly 20 gigabytes), the imagery was evaluated for spectrally distinct classes contained within the entire study area for both seasons. The distribution of falcon use sites among the land cover classes was examined to identify classes that corresponded with falcon presence.

Once converted to ArcGrid, FRAGSTATS software was used on the classified images to calculate landscape metrics around falcon use sites using the thematic grids as input. This information, coupled with that of the configuration and composition of land cover classes within a larger landscape, was used in the habitat modeling process. Five predictor variables were converted to binary

grids and added to create an output map representing ranges of Aplomado Falcon habitat suitability. Higher values in the map represent areas where a greater number of qualifying criteria were met, and lower values represent areas where fewer criteria were met. The binary input layer and final predictive model grids were converted to images in ERDAS IMAGINE; then all files were combined into one.

Accuracy assessment analyses determined that the resulting model was highly effective in predicting "places of promise" for Aplomado Falcon conservation. At least 67 percent agreement was found between the field assessed and predictive model

rankings at evaluated field sites. (Errors were largely attributed to differences in assigning like predictive values between field biologists and predictive model values.) Each of the 21 prospective or known falcon habitat assessment areas that were identified independent of spatial modeling, contained habitat with high predictive ranking. Cartographic production was performed using the ArcMap tool within ArcGIS Desktop. The resulting predictive model and map of suitable Aplomado Falcon habitat now serves as an effective tool for identifying areas similar to falcon use areas in Chihuahua.

For more information about NMCFWRU, visit: <http://leopold.nmsu.edu/fwscoop/>.

For more information about Peregrine Fund falcon conservation initiatives, visit: <http://www.peregrinefund.org>.