Refining Conservation Delivery in Nebraska's Central Loess Hills through integration of Decision Support Tools : Summary

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Introduction

In 2001, Congress established the Wildlife Conservation and Restoration program and the State Wildlife Grants programs. These programs provide states with funding to develop proactive measures to maintain biodiversity and address habitat needs of rare and declining species. To receive these funds, each state was required to develop a State Wildlife Action Plan. Nebraska's plan, the Nebraska Natural Legacy Project, is considered a model landscape-scale, science-based State Wildlife Action Plan, serving as a planning template for many other states. The Nebraska Natural Legacy Project used a combination of species occurrence data, landscape inventories, and Geographic Information Systems (GIS) analysis to identify specific "Biologically Unique Landscapes" (BULs) throughout the state. The BUL system was developed to locate areas that harbor at-risk species and provide the greatest opportunity to conserve and restore native natural communities. Based upon this information BULs were delineated with the expectation that conservation delivery in these landscapes would significantly contribute to the sustainability of rare and declining species, maintain unique habitats, and ultimately sustain Nebraska's biodiversity.

The Central Loess Hills Region (CLHR) of Nebraska was identified in the Nebraska Natural Legacy Plan and contains three BULs (Central Loess Hills BUL, Lower Loup River BUL, and Upper Loup BUL). The region consists of rolling to steep loess hills, dissected by the valleys of the Loup Rivers. The hills are now a mosaic of mixed-grass prairie and cropland. The meadows associated with the Loup Rivers are some of the most intact meadow systems in the state. Aggressive management of grazing on grasslands, exotic plant invasion, widespread herbicide spraying, and the removal of fire from the ecosystem have resulted in the degradation of the majority of Central Loess Hills grasslands. The flatter tablelands of this landscape contain playa wetlands that are used by Whooping Cranes and numerous other waterbirds during migration.

To increase conservation delivery activities in BULs, coordinating wildlife biologist positions were added to increase delivery capacity, which was identified as the limiting factor in conservation delivery. The coordinating wildlife biologists closely interact with conservation agencies and organizations that function within the BUL. This close coordination increases communication and ensures conservation programs are leveraged to maximize conservation resources to areas in the landscape that have the greatest potential to benefit the priority species and ecosystems. As the biologist and partners began the process of focusing their efforts in the Central Loess Hills BUL, it became apparent that there were data gaps and key uncertainties that prevented implementation of focused and targeted conservation activities in areas with the greatest potential to benefit the priority species.

Working with the conservation partnership in the Central Loess Hills BUL, this project was designed to develop the necessary baseline data and species habitat models needed to guide targeted conservation. Development of a conservation portfolio for the Central Loess Hills required five separate but equally important elements. The elements of this project were: 1) Develop a spatially accurate landcover that delineates key habitats to which at-risk species respond, 2) Analyze landcover to develop meaningful landscape indices that can be used to develop spatially explicit species habitat models, 3) Collect and compile occurrence data for priority species (Greater Prairie-Chicken, Whooping Crane, and waterfowl), 4) develop conceptual and empirical models that describe species-habitat relationships and priority areas and habitat features on the landscape that should be targets for future conservation activities, 5) Establish population targets that can be translated to habitat objectives to support priority species at target levels.

Landcover Development

In 2010, the Rainwater Basin Joint Venture (RWBJV) began an initial mapping process for the Central Loess Hills with the goal of creating a baseline habitat inventory, by incorporating the most current datasets available (e.g., National Land Cover dataset, GAP). We adopted the Hierarchical All-Bird Strategy land-cover classification system developed by Playa Lakes Joint Venture (PLJV) because it delineates habitats relevant to bird conservation. Peer review of the PLJV landcover (2004) by conservation professionals indicated that certain landscape features (e.g., tree canopies, wetland features) were frequently omitted, and dry-land cropping systems and grassland habitats were misclassified because of the scale at which data had been collected and classified. Indeed, such errors were manifested in the 2009 Central Loess Hills land-cover. Further steps were therefore needed in order to refine the land-cover data to a finer scale.

In order to improve the land-cover for the Central Loess Hills BLU, a Common Land Unit dataset was integrated with wetland features delineated in the National Wetlands Inventory (NWI) dataset and soil survey geographic dataset, and was further refined by photo interpretation. During this process technicians validated current features including: cropping activity, developed areas, riparian corridors and shelterbelts, and changes in playa wetland function through photo-interpretation. The photo-interpreted refinement was based on 2010 one-meter spatial resolution National Agriculture Imagery Program (NAIP) color imagery viewed at a 1:5,000 scale. The final land-cover provides a substantially different and more accurate interpretation of the landscape compared to the initial 2009 product.

Species Occurrence Data

To develop an empirical model for Greater Prairie-Chicken, traditional roadside surveys were performed to identify and record presence and absence of leks. In the Central Loess Hills, 10 routes were developed and completed every year since 2009. Routes were run annually from March 15 through May 31. Surveys started 45 minutes before sunrise on days with calm winds (<10 mph) and low cloud cover. Along the routes, survey stops are made at approximately one-mile increments. The surveyor spends two minutes at each stop, listening and scanning for displaying males, and records the presence or absence of leks at each location.

Empirical Model Development for Greater Prairie-Chicken

To complete the statistical analysis, all positive and negative points were attributed with information from the multi-scale habitat indices (*i.e.*, % grassland in the surrounding landscape). Analysis was conducted on an annual basis, thereby creating models for 2009, 2010, and 2011. We used binomial generalized linear models (logistic regression) to produce the predicted probability of lek occurrence; and Akaike's Information Criterion (AIC) was used to identify the model that best fit our data. Once the statistical models were completed, an aggregate model was produced by averaging the relative probability of occurrence from each model to produce a product that represented the average probability of occurrence over three years. The aggregate model was the final product used to guide conservation delivery for Greater Prairie-Chicken in the Central Loess Hills region (Fig.1).

For information on the Whooping Crane and Waterfowl Priority Wetland Model please refer to the original document.

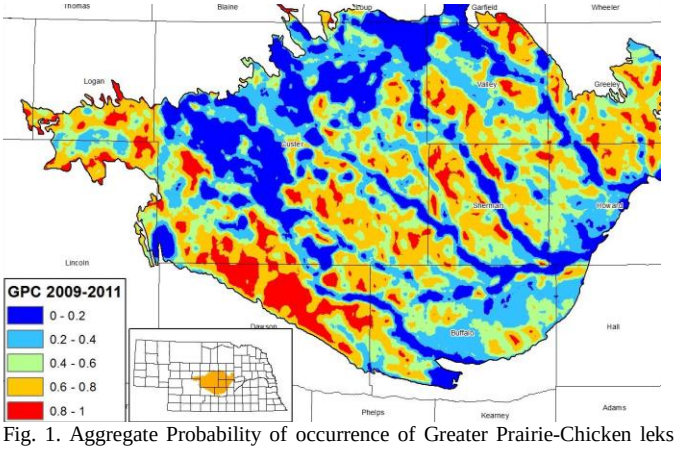

Fig. 1. Aggregate Probability of occurrence of Greater Prairie-Chicken leks in the Central Loess Hills region.

Decision Support Tools

To assist the coordinating wildlife biologists, a Decision Support Tool (DST) was developed to identify tracts that had the highest potential to positively influence Greater Prairie-Chicken lek occurrence in the Central Loess Hills region. This tool can serve as a guide for the coordinating wildlife biologist to target landowner outreach and prioritize contacts when delivering conservation projects. This DST integrates three site characteristics: 1) probability of occurrence for GPC leks, 2) percentage of trees within 1600 km, and 3) the percentage of grass within 1600 km. To develop this DST, the Common Land Unit Dataset field boundaries were attributed using zonal statistics in a GIS. This process added a data field into the tabular data associated with the Common Land Unit Dataset to describe the percent grassland, percent woodland cover, and average relative probability of occurrence for each field boundary. Once attributed, a query was created that established three categories (high, medium, and low) for each of the data fields. Fields in the "low" category had a probability of GPC lek occurrence between 0.0% and 40.0%; "medium" class probability of lek occurrence was between 40.1% and 77.0%; and the "high" probability fields had a relative probability of lek occurrence between 77.1% and 100%. A similar quantile approximation was created as an index for high, medium and low percentage of grass cover and percentage of woodland cover (Fig. 2.).

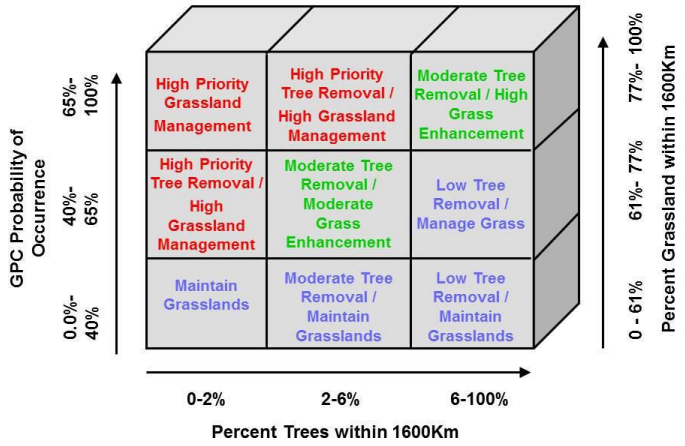

Fig. 2. Decision matrix to help guide grassland enhancement activities in the Central Loess Hills region of Nebraska.

Discussion

The collection and integration of new datasets was tedious and time consuming, but the effort was validated by the high degree of accuracy (>95%) in the final product. Further evidence of the accuracy of the land-cover is provided by application of the lek probability models. Data in both the Northeast and the Southeast models had a high Area Under the Receiver-Operator Curve (AUC) value (>0.79), indicating a high degree of agreement between the predicted and observed occurrence. Often with logistic regression analysis, AUC values above 0.70 are considered acceptable; values greater than 0.90 are seldom achieved.

In the Central Loess Hills Greater Prairie-Chicken model, the species responded to land-cover variables at the 1600m spatial scale. Results indicate either that the grassland area requirement of GPC is less than previously thought, or that GPC are also influenced by local factors within blocks of grassland. These data complement the findings of other recent studies on Greater Prairie-Chicken, which found regional variation of area sensitivity in several priority grassland species.

For additional information regarding the analysis, results and discussion consult the full document.