Aldridge, C.L., S.E. Nielsen, H.L. Beyer, M.S. Boyce, J.W. Connelly, S. T. Knick, and M.A. Schroeder. 2008. Range-wide patterns of greater sage-grouse persistence. Diversity and Distribution 14:983-994.

Abstract:
Aim - Greater sage-grouse (*Centrocercus urophasianus*), a shrub-steppe obligate species of western North America, currently occupies only half its historical range. Here we examine how broad-scale, long-term trends in landscape condition have affected range contraction.

Location - Sagebrush biome of the western USA.

Methods - Logistic regression was used to assess persistence and extirpation of greater sage-grouse range based on landscape conditions measured by human population (density and population change), vegetation (percentage of sagebrush habitat), roads (density of and distance to roads), agriculture (cropland, farmland and cattle density), climate (number of severe and extreme droughts) and range periphery. Model predictions were used to identify areas where future extirpations can be expected, while also explaining possible causes of past extirpations.

Results - Greater sage-grouse persistence and extirpation were significantly related to sagebrush habitat, cultivated cropland, human population density in 1950, prevalence of severe droughts and historical range periphery. Extirpation of sagegrouse was most likely in areas having at least four persons per square kilometre in 1950, 25% cultivated cropland in 2002 or the presence of three or more severe droughts per decade. In contrast, persistence of sage-grouse was expected when at least 30 km from historical range edge and in habitats containing at least 25% sagebrush cover within 30 km. Extirpation was most often explained (35%) by the combined effects of peripherality (within 30 km of range edge) and lack of sagebrush cover (less than 25% within 30 km). Based on patterns of prior extirpation and model predictions, we predict that 29% of remaining range may be at risk.

Main Conclusions - Spatial patterns in greater sage-grouse range contraction can be explained by widely available landscape variables that describe patterns of remaining sagebrush habitat and loss due to cultivation, climatic trends, human population growth and peripherality of populations. However, future range loss may relate less to historical mechanisms and more to recent changes in land use and habitat condition, including energy developments and invasions by non-native species such as cheatgrass (*Bromus tectorum*) and West Nile virus. In conjunction with local measures of population performance, landscape-scale predictions of future range loss may be useful for prioritizing management and protection. Our results suggest that initial conservation efforts should focus on maintaining large expanses of sagebrush habitat, enhancing quality of existing habitats, and increasing habitat connectivity.