Connecting pattern and process in greater sage-grouse populations and sagebrush landscapes

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Abstract

Abstract. Spatial patterns influence the processes that maintain Greater Sage-Grouse (Centrocercus urophasianus) populations and sagebrush (Artemisia spp.) landscapes on which they depend. We used connectivity analyses to: (1) delineate the dominant pattern of sagebrush landscapes; (2) identify regions of the current range-wide distribution of Greater Sage-Grouse important for conservation; (3) estimate distance thresholds that potentially isolate populations; and (4) understand how landscape pattern, environmental disturbance, or location within the spatial network influenced lek persistence during a population decline. Long-term viability of sagebrush, assessed from its dominance in relatively unfragmented landscapes, likely is greatest in south-central Oregon and northwest Nevada; the Owyhee region of southeast Oregon, southwest Idaho, and northern Nevada; southwest Wyoming; and south-central Wyoming. The most important leks (breeding locations) for maintaining connectivity, characterized by higher counts of sage-grouse and connections with other leks, were within the core regions of the sage-grouse range. Sage-grouse populations presently have the highest levels of connectivity in the Wyoming Basin and lowest in the Columbia Basin Sage-Grouse management zones (SMZs). Leks separated by distances 13-18 km could be isolated due to decreased probability of dispersals from neighboring leks. The range-wide distribution of sage-grouse was clustered into 209 separate components (units in which leks were interconnected within but not among) when dispersal was limited to distances 18 km. The most important components for maintaining connectivity were distributed across the central and eastern regions of the range-wide distribution. Connectivity among sage-grouse populations was lost during population declines from 1965-1979 to 1998-2007, most dramatically in the Columbia Basin SMZ. Leks that persisted during this period were larger in size, were more highly connected, and had lower levels of broad-scale fire and human disturbance. Protecting core regions and maintaining connectivity with more isolated sage-grouse populations may help reverse or stabilize the processes of range contraction and isolation that have resulted in long-term population declines.

Study Area