Sage-Grouse Habitat Relationships: A Review of what is Known

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Abstract: Sage-grouse (*Centrocercus minimus, C. urophasianus*) are known to be dependent upon sagebrush (*Artemisia* spp.) steppe throughout their distribution. This paper reviews the relationship of sage-grouse to sagebrush through the major biological periods of the year. Species of sagebrush used varies by area from silver sage (*A. cana*) in northern and eastern areas to black sagebrush (*A. nova*) in the south. Subspecies of big sagebrush (*A. tridentata tridentata, A. t. vaseyana, A. t. wyomingensis*) are most important wherever they occur. Other species such as low (*A. arbuscula*) and three-tip (*A. tripartita*) sagebrush are locally important. In winter, sage-grouse are totally dependent upon the leaves of live sagebrush for food and the structure (height, canopy cover) of sagebrush plants for cover. Sage-grouse prefer to nest under taller (>30 cm), live sagebrush plants with 15-25% canopy cover with abundant, taller (>15cm) grasses and forbs. Broods prefer areas with an abundance of succulent forbs and grass cover within a healthy sagebrush community. Forbs continue to be extensively used in summer and fall, when use of sagebrush leaves for food increases. Use of taller and more robust sagebrush for cover increases in fall although substantial use by sage-grouse is made of flat and ridge-top areas. Management of sagebrush communities should focus on maintaining and enhancing existing areas used by sage-grouse. This can be accomplished by reducing sagebrush habitat loss, fragmentation, and degradation.

Key Words: *Artemisia* spp., *Centrocercus minimus, C. urophasianus*, habitat, management, sagebrush, sage-grouse.

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Sage-grouse once occupied suitable habitats in 16 states and 3 Canadian provinces in western North America (Aldrich 1963, Johnsgard 1973). They now occur in 11 states and 2 Canadian provinces having been extirpated in Arizona, British Columbia, Kansas, Nebraska, New Mexico, and Oklahoma (Johnsgard 1973, Braun 1998). Sage-grouse have been listed as endangered in Canada (Aldridge 2000) and petitions have been filed to list sage-grouse in the State of Washington and the Gunnison sage-grouse (*C. minimus*) under the federal Endangered Species Act.

Concurrent with the overall decrease in distribution of sage-grouse, especially at the periphery of the original range (Braun 1995, 1998), the abundance of the species has also markedly decreased. Estimated declines since about 1978-80 are in the range of 17-47% (Connelly and Braun 1997) and 45-82% (Braun 1998). Total population size prior to European settlement is unknown and may have been close to 2 million birds (CEB estimate). The most recent population estimate was greater than 142, 000 birds in spring 1998 (Braun 1998).

The reasons for the documented decline in distribution and abundance are generally related to habitat degradation, fragmentation, and loss (Braun 1995, Connelly and Braun 1997, Braun 1998). Habitat loss is usually permanent while fragmentation (in part) and degradation can be temporary depending upon management strategies that may be implemented. As a consequence of the dependence of sage-grouse on sagebrush, guidelines for management of sagebrush habitats were developed and promoted by the Western Association of Fish and Wildlife Agencies through the Western States Sage Grouse Technical Committee (Braun et al. 1977). These guidelines were based on the scientific literature and widely used. More recently, these guidelines were rewritten and

expanded based on scientific research since development of the 1977 publication (Connelly et al. 2000). The need for guidelines is clear because of the decreases in population size and distribution as well as the need for standardization of approaches that cross local, state, and even regional boundaries. The evidence (Connelly et al. 2000) clearly demonstrates that sage-grouse use of habitats and the problems in maintaining useful habitats are similar across the range of the species. This paper presents a review of what is known about sage-grouse habitat requirements throughout the year and provides focus for managing habitats to benefit sage-grouse.

Sage-Grouse Habitat Overview

Winter

Sage-grouse are totally dependent upon sagebrush habitats in winter as the leaves provide forage and the plants, individually and collectively, provide cover (Connelly et al. 2000). In some areas and years, sagebrush abundance does not limit distribution of sage-grouse. In areas with heavy snowfall and or severe winters, sagebrush may become unavailable and sage-grouse may be restricted to 10% of the overall area (Beck 1977). Sage-grouse prefer taller (>25-30 cm) sagebrush with canopy cover (>10-30%) for use in winter (Connelly et al. 2000). Topographic relief is also important and sage-grouse prefer south and south-west aspects, low, flat areas, ridge tops, drainages with tall (> 40 cm) sagebrush, and windswept ridges where sagebrush is exposed (Hupp and Braun 1989b, Robertson 1991). Generally, sage-grouse gain body mass over winter (Beck and Braun 1978) although exceptions can occur during severe winters (Remington and Braun 1988, Hupp and Braun 1989a).

Spring

Timing of spring activities is weather and elevation dependent. This period generally starts in mid March, when sage-grouse are initiating breeding displays, continues in late April and May, when sage-grouse are nesting, and concludes in late May to early June when incubation of first nests is completed. Breeding areas may be close to or far removed from winter use sites (Connelly et al. 2000). Breeding sites (leks or strutting grounds) are generally traditional and near where numbers of females occur. Sites chosen are usually snow free, open areas with short vegetation adjacent to tall (30-80 cm) more dense (15-25% canopy cover) sagebrush used for escape and loafing cover (Connelly et al. 2000). Both visibility and hearing acuity are important attributes of display areas. Nesting in good quality, undisturbed habitats generally occurs within 3.2 km of leks but may be as close as 100 m to as far as 40+ km (Connelly et al. 2000).

Sage-grouse generally place their nests under live, taller (30-80 cm) sagebrush bushes with canopy cover ranging from 15 to 25%. The height (>18 cm) and density (>15-25%) cover of herbaceous vegetation in nesting areas is important to help hide females on nests and chicks upon successful termination of incubation (Connelly et al. 2000). Early brood habitats are those within 300 m to 1 km of nest sites and are dominated by forbs and grasses (> 15% cover, > 18 cm in height) within a vegetation community with live sagebrush canopy cover of 10-25% (Connelly et al. 2000). Forbs are a major food source for all age classes of sage-grouse although insects comprise much of the foods taken by chicks for the first several weeks of life (Drut et al. 1994, Fischer et al. 1996). Leaves of sagebrush continue to be eaten by adult sage-grouse although in lesser amounts than in winter (Wallestad et al. 1975).

Summer

Forbs and grasses (> 15 % cover and much higher) continue to comprise important habitat components although sage-grouse seek taller (> 40 cm) sagebrush with greater than 15 % canopy for loafing and escape (Connelly et al. 2000). Mesic sites along natural streams, irrigation ditches, hay meadows, and irrigated crops in or near sagebrush uplands are also extensively used by sage-grouse in summer. Strips of live sagebrush greater than 200 m width adjacent to hay meadows, crop fields, riparian areas, etc. are important for escape cover (Dunn and Braun 1986). Generally, habitats useful to sage-grouse are not limiting during summer provided mesic areas are well distributed in and adjacent to sagebrush habitats. Forbs continue to be major foods for sage-grouse although use of live sagebrush leaves increases (Peterson 1970, Wallestad et al. 1975).

Fall

Sage-grouse movements increase in fall and there is general dispersal from mesic habitats (Connelly et al. 2000). Some use persists of summer habitats, especially if sagebrush uplands remain desiccated. While habitats used are variable, use of forbs continues although leaves of sagebrush constitute a larger proportion of all diets (Wallestad et al. 1975). Taller (> 40 cm) sagebrush with a canopy cover of greater than 15 % (Connelly et al. 2000) is extensively used (as are snow accumulation sites on north aspect slopes, especially where forbs remain green). Flock sizes generally become larger as sage-grouse broods and summer flocks disperse and reform into groups.

Managing Habitats For Sage-Grouse

That sage-grouse need sagebrush-dominated habitats is clear. Of importance is the size, distribution of seasonal-use components, and lack of fragmentation of habitats.

Minimum or optimal size of habitats is not well understood. Sage-grouse are known to persist in areas as small as 16 km square. However, such populations are small (< 30 birds in spring) (Nehring and Braun 2000) and subject to catastrophes and extirpation. At the present stage of knowledge, all that can be suggested is that size of areas that are most useful must be large (>250 km square at a minimum) with good distribution of seasonal use components. Fragmentation of habitats reduces the effective size of areas that can be used by sage-grouse, separates seasonal use areas, increases the risk of genetic isolation, and reduces population size and survival. Sage-grouse are landscape scale species well adapted to seasonally moving among habitats (Connelly et al. 2000). Thus, the importance of managing sagebrush habitats at the scale of geographic regions and not political boundaries cannot be over emphasized.

Focus should be placed on managing existing habitats that are used by sage-grouse. This includes management of fire and domestic livestock grazing. Fire in the big sagebrush type is generally negative for sage-grouse (Connelly et al. 2000) and sagebrush communities (Wambolt et al. 2001). Review of past grazing studies (Holechek et al. 1999) suggests that for health of western rangelands to improve, changes in annual herbage removal should be implemented. Consideration should also be given to enhancing habitats for sage-grouse, restoring degraded habitats, and rehabilitating habitats no longer capable of sustaining the annual life processes of the sage-grouse. Thus, there is no shortage of management experiments that can be conducted to benefit sage-grouse. Indeed, the published guidelines (Connelly et al. 2000) list 33 recommendations for management, protection, and restoration of sagebrush habitats to benefit sage grouse.

One approach that is gaining wide acceptance is local preparation of conservation plans for specific populations of sage-grouse (Hemker and Braun 2001). These plans are location specific with detailed conservation actions. It is too early to speculate upon the success of these local plans as implementation of specific actions is just underway. Responses of vegetation and sage-grouse may be slow which emphasizes the need for long-term monitoring and reporting of results at specified intervals.

The Future

The future is unclear for sage-grouse anywhere within their range. We can be reasonably confident that more habitat will be lost, there will be more habitat fragmentation, more intensive management of habitats to specifically benefit sage-grouse will occur, there will be less hunting opportunity, further loss of genetic diversity, and more private/public partnerships. Unfortunately, there may also be further extirpations of local populations.

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