

Cows, insects, and plants: How do they fit in the sage-grouse puzzle?

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Greater sage-grouse populations have been declining over the past half century, in part due to low annual recruitment which has been attributed to poor quality brood-rearing habitat. Sage-grouse population decline is concurrent with a decline in the extent and quality of the sagebrush biome. Habitat loss is multifaceted including urbanization, invasion by exotic and native species, increased occurrence of wildfires, energy development etc. One component of habitat quality that is poorly understood is the positive relationship between sage-grouse brood and chick survival and the abundance of food insects, particularly caterpillars (larva of moths and butterflies)

It has been well documented that sage-grouse chicks need insects during early brood-rearing to enhance diet quality and increase chances of survival. Numerous studies show ants and beetles to be the main insects consumed by sage-grouse chicks during early brood-rearing. Less commonly reported in the diet, caterpillars are high in protein and fats and, when available, are high-quality components in sage-grouse chick diets. Research by Gregg and Crawford reported evidence directly linking sage-grouse chick survival with caterpillar abundance.

Identifiable relationships between the plant community and insects may have a significant impact on habitat management for sage-grouse as well as affecting policies regarding a variety of land use activities, such as off-road vehicle use, livestock grazing, and public recreation. Managing for factors that can increase the chance of survival, such as structural habitat diversity, food quality, and food availability is critical for keeping sage-grouse populations stable. Therefore, if plant community structure and composition can be related to food resources, land managers have valuable information for making management decisions about sage-grouse habitat.

The focus of this study was to investigate correlations between vegetation measurements and insect abundance. To accomplish this, plant community composition and structure in mountain big sagebrush dominated sites under winter and spring cattle grazing as well as in rabbitbrush dominated dry meadow and upland type communities were quantified. Additionally, within each of these plant community

types we determined the abundance of insects that sage-grouse chicks have been documented to consume: ants, darkling beetles, scarab beetles, grasshoppers, and caterpillars.

This two-year study tested the relationships between insect, vegetation, and year differences between two seasons of cattle grazing on four sites dominated by mountain big sagebrush. Additionally, the same relationships were tested on an upland and dry meadow dominated by rabbitbrush. Plant cover and community composition were measured, along with plant height and distance between perennial plant bases. Insect abundance was measured using pitfall traps. Traps were set out for a 10 week period, beginning the first week of May and collected every other week. This time period corresponds with probable sage-grouse brood rearing in the study area (central Oregon).

Several vegetation measurements were significantly different between the winter and spring grazed sagebrush sites. Sites with spring cattle grazing had higher total shrub cover and sagebrush cover than the winter grazed sites. Spring grazed plots had an average gap size between plant bases of 50 inches compared to an average gap size of 40 inches for winter grazed plots. Also, grasses were taller under winter grazing management. Significant differences in vegetation were also observed between the two rabbitbrush sites. In the meadow site, shrub cover, vegetative cover, and shrub height were greater than the upland site. Also, the upland site had greater distances between perennial plant bases than the meadow site (55 in and 25 in, respectively).

Caterpillar abundance was different between years in the sagebrush sites with more in 2007 than 2008 (plot average = 6 vs. 2, respectively). However, there were no significant differences between caterpillar abundance by season of grazing when both years were combined, or when tested individually. Caterpillar abundance was different between rabbitbrush sites, with meadow plots having on average, four times more than upland plots (20 vs. 5 per plot). Unlike the sagebrush sites, caterpillar abundance showed no differences between years in the rabbitbrush dominated areas. In addition, caterpillars were more abundant in areas with greater vegetative cover and less distance between perennial plant bases.

Grasshopper, scarab beetle, and darkling beetle abundance were different between seasons of grazing. Winter grazed areas exhibited a greater abundance of grasshoppers and darkling beetles, while the spring grazed areas had greater scarab beetle abundance. Grasshopper abundance was also

different between the meadow and upland rabbitbrush sites with the upland plots having almost three times more.

The rabbitbrush sites provided a noticeably greater abundance of caterpillars longer than the sagebrush sites, which has direct implications for sage-grouse broods that are from a second or third nest attempt. As the summer progresses insect supply dwindles, therefore having areas that provide these resources later in the season may be critical for hens that fail their initial nesting attempt.

Consistent with other studies, the meadow location provided the greatest abundance of insects, especially caterpillars, and the most forb cover compared to all other sites. Although this is a rabbitbrush dominated meadow, it is surrounded by mountain big sagebrush communities and western juniper woodlands. The resulting landscape heterogeneity may be necessary to provide the complex and diverse habitats needed by sage-grouse. This research suggests that having this community type represented within the landscape may provide high-quality brood-rearing habitat for sage-grouse. However, these results are not to promote the deterioration of dry meadows that are in good condition, but if the area is already dominated by rabbitbrush, managers may choose to maintain this type of plant community for the benefit of sage-grouse brood-rearing. Compared to the spring grazed sagebrush site, the winter grazed site exhibited greater darkling beetle and grasshopper abundance and less sagebrush and shrub cover, taller grasses and shrubs, and shorter distances between plants. Caterpillar numbers declined with increased distance between plants and increased sagebrush cover, but caterpillar numbers increased with more perennial grass cover, rabbitbrush cover, taller shrubs, and more vegetative cover. The upland rabbitbrush site also had greater forb cover than any of the sagebrush sites, suggesting that having patches with rabbitbrush dominance may provide good quality foraging habitat for sage-grouse broods within broader sagebrush dominated landscapes. As a vital component of sage-grouse chick survival, inclusions of plant community types that support a diversity and high abundance of forbs and insects should be added to monitoring plans or assessments of current or potential sage-grouse brood-rearing habitat.

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Literature Review

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Sage-grouse habitat loss is occurring for a variety of reasons including urbanization, invasive plants, wildfires, and energy development. Sage-grouse chicks need insects to survive their first few weeks of life; these insects show preferences for some types of vegetation. A study was done on rangelands in central Oregon to investigate the relationships between vegetation composition and structure, season of use and insect abundance. In general, insects were more abundant in areas with greater vegetative cover, less distance between perennial plant bases and more forbs. The rabbitbrush sites provided a noticeably greater abundance of caterpillars longer than the sagebrush sites, which has direct implications for sage-grouse broods that are from a second or third nest attempt. As the summer progresses insect supply dwindles, therefore having areas that provide these resources later in the season may be critical for hens that fail their initial nesting attempt. The study suggests that having patches with rabbitbrush dominance may provide good quality foraging habitat for sage-grouse broods within broader sagebrush dominated landscapes and these locations should be included in monitoring and assessments of current or potential sage-grouse brood rearing habitat. It confirms again that heterogeneous vegetation communities are necessary to provide the complex and diverse habitats needed by sage-grouse. Livestock are an excellent tool that land managers can use for vegetation manipulation to provide plant community characteristics like shrub and grass height that promote insect abundance.