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Livestock Grazing and Sage-grouse: Science, Policy, and the 7-inch Rule

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Livestock grazing is the most common land use on rangelands throughout western North America. Over 80 percent of sage-grouse habitat is currently grazed by domestic livestock. While livestock grazing is often addressed by popular media and advocacy groups as having a negative impact on sage-grouse, the actual science is much more complex. In a recent study of the effects of livestock grazing on all grouse species, researchers found that only three peer-reviewed articles actually measured the impact of livestock grazing on grouse vital rates (Dettenmaier et al. 2017). Vital rates are factors that impact the number of births and deaths within a population. In other words they determine changes in the number of animals in a population. These studies were all conducted in Europe using sheep and only involved two grouse species; red grouse (*Lagopus Lagopus scotica*) and black grouse (*Lyrurus tetrix*). When it comes to sage-grouse, we are only beginning to understand the impacts of livestock grazing.

Figure 1. A male sage-grouse on a lek in northern Utah with a cow nearby. Livestock grazing is the most common land use of sagebrush systems and sage-grouse habitat. Photo Credit: Todd Black

In the U.S. Fish and Wildlife Service (USFWS) recent (2015) Endangered Species Act (ESA) listing decision, livestock grazing was determined to be a compatible use with sage-grouse and was not considered a range-wide threat to the species (USFWS 2015). However, livestock grazing was determined to have a potential for negative impact at small local scales when improper grazing management occurs. In coordination with the 2015 ESA listing decision the Bureau of Land Management (BLM) and the U.S. Forest Service (USFS) developed land-use and resource plan amendments for sage-grouse. These two agencies combined, oversee the majority of remaining sage-grouse habitat, though private and state lands are also important especially for some local populations. Livestock grazing was originally one of the primary land uses managed for on BLM and USFS lands, but now grazing is managed as part of a broader multiple-use mission. Though livestock grazing was determined to be a compatible use, it became one of the more prominent management issues addressed in federal plan amendments to avoid future negative impacts to the species.

Figure 2. The dark grey mass, encircled by the oval shape, is a radio-marked female sage-grouse incubating her nest. Sage-grouse nests are rarely easily seen, but this nest had one opening, from the camera's angle, which lacked vegetation to obstruct the view. Of note, this nest hatched successfully, likely due to the heavy overhead shrub canopy that is typical of sage-grouse nests.

Livestock grazing has the potential to have positive, neutral, or negative impacts on sage-grouse (Beck and Mitchell 2000). Though sage-grouse rely on sagebrush for their entire annual life-cycle and it is their primary food source during the winter, they do require other vegetation types. Sage-grouse females need to eat flowering herbs; i.e., forbs, in the spring to meet nutrient demands for developing eggs. Adults, and especially chicks, readily consume forbs during the summer, but even more important are the insects associated with these forb-rich communities that provide the protein essential for chicks as they grow. Grasses are consumed incidentally by grouse and usually in very small amounts (Dahlgren et al. 2015). However, the main concern with grazing is that livestock eat grass at the same time that sage-grouse may be using grass for cover. Managers and special interest groups are concerned that livestock foraging could reduce cover to the point that it negatively impacts sage-grouse. Although notably, the relationship of grass height and sage-grouse nest survival has become less clear with recent scientific findings.

Figure 3. A sage-grouse brood hen (far right), and three half-grown chicks (upper left), foraging in a grass and forb rich sagebrush community. Photo credit: L. Flake

Lost in Implementation: The 7 Inch Rule

Where did the issue of grass height all begin? In 2000, a group of scientists published range-wide sage-grouse habitat guidelines (Connelly et al. 2000). They used published information on sage-grouse habitat characteristics available at the time. Guidelines included recommendations for cover and height of sagebrush and herbaceous plants (i.e., grasses and forbs) during breeding, summer, and winter seasons. During the breeding period, when sage-grouse females are nesting, the authors recommended grass height to be > 18 cm, or 7 inches. Subsequently, over the last decade or more as agencies and others started to focus more on managing for sage-grouse nesting habitat, a 7-inch rule began to emerge as a common standard for policy and planning efforts.

There was uncertainty about the 7-inch grass height guideline from the beginning. Though Connelly et al. (2000) developed their guidelines using many peer-reviewed publications, they only reported one study in Oregon that found grass height of ≥ 7 inches to be positively correlated with nest survival. Later, in a similar study in Montana, Doherty et al. (2014) reported the same relationship between ≥ 7-inch grass

height and successful nests, which seemed to provide confirmation for the 7-inch rule. Interestingly, in 2015 the authors Doherty et al. (2014), through the University of Wyoming Extension, published a response to some advocacy groups explaining that it would be inappropriate to use their results to set grazing management regulations. Though this information was made publically available several months before the 2015 ESA listing decision, many of the federal plan amendments adopted the 7-inch rule at the time of the Record of Decision (i.e., September 2015). Long before the 2015 decision, some researchers questioned how grass height changes during the nesting period and the impact this might have on nest survival analyses.

From the time a hen selects a nest site in late April and early May until hatch (~ 37 days), grass height in most areas changes dramatically. Most of the previous sage-grouse nest survival studies measured grass height at the time of nest fate; i.e., when the hen stopped incubating the nest due to predation, abandonment, or the eggs hatching. Predation and abandonment events naturally occur earlier than hatching during the lifetime of a nest; therefore, if grass height is measured earlier in the nesting period grass would be shorter than at nests that eventually hatched. Therefore, some researchers began to question if an inherent bias in grass height measurements was unintentionally included in past nest survival analyses (Figure 4).

Gibson et al. (2016) confirmed that this bias existed and demonstrated the impact of the bias on survival analyses. In their study, they flushed sage-grouse hens off their nests during the incubation period and determined the age of the eggs. Thus, they were able to estimate a potential date when the eggs would hatch for each nest. Then they measured grass height for unsuccessful nests twice; once at the time of fate, and again at the estimated hatch date. Successful nests were measured once at time of hatch, like past studies. They showed that the supposed relationship between grass height and nest success was not real, but rather a product of the inherent bias in the timing of vegetation measurements. They suggested that the results of past studies likely incorporated this same bias in the past. Other research using multiple studies across sage-grouse range has arrived at the same conclusions (Smith et al. 2017). The general conclusion is that most studies in the past included this bias when they reported taller grass height being correlated with increased nest survival.

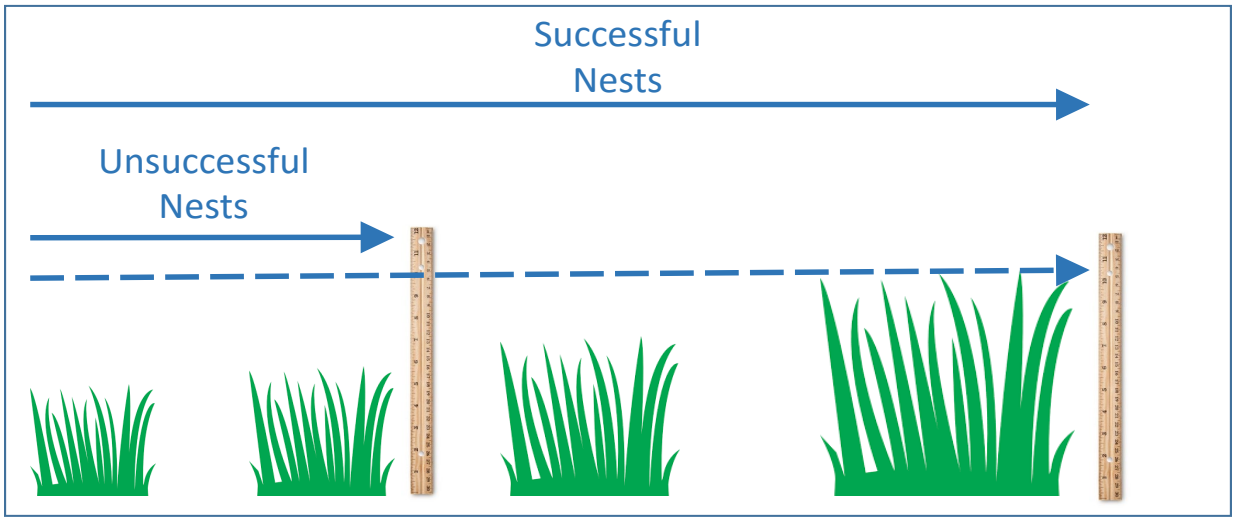

Figure 4. A simple demonstration of how sampling bias affected grass height measurements within past nest survival studies. In this graphic time is represented horizontally increasing from left to right, demonstrating the seasonal growth of grasses over time. The solid lines represent when most studies completed vegetation sampling to obtain grass heights. The dashed line represents when an unsuccessful nest "would" have had the grass measured if it had been successful.

The bottom line is that the 7-inch grass height rule has been debunked, and now adjustments must be made to align federal and state grazing regulations and policies with the best available science. **So, does that mean grass height doesn't matter? No!** Grasses still provide cover for sage-grouse and are a critical component of sagebrush communities. Some positive relationships in certain areas may still exist between grass height and nest survival. However, grass height objectives should be based on site potential and tailored to local habitat conditions. It is important to note that within the Connelly et al. (2000) guidelines the authors state that local habitat conditions may vary and should be taken into consideration if local information is available.

Conclusions

Research on the impact of livestock grazing on sage-grouse is still relatively incomplete. Multiple studies are currently underway and we look forward to their results. The fact is livestock grazing management is complex and variable as it is currently applied to a variety of landscapes. It will take many years to answer important scientific questions that might reveal guiding principles. Understanding the limitation of our current knowledge is important if we are to deal with the uncertainty in current conservation efforts. The 7-inch rule is now a thing of the past and we can move forward with more appropriate efforts and guidelines to managing habitat. Lastly, and most importantly, we need to keep the intact sagebrush systems that sage-grouse require at landscape scales in the forefront of our collective thoughts. If our continuous intact sagebrush communities cease to exist and continue to become fragmented and degraded we will not have any sage-grouse, nor sustainable livestock grazing, left to manage.

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Photo Credit: L. Flake for header photo.