

Science to Solutions

Taking the Bias Out of Sage Grouse Nesting Studies



In Brief: When managing habitat for sage grouse, adequate grass height for hiding cover has been emphasized as an important component for these ground nesting birds. However, new findings that replicate previous work further validate that methods now known to be biased are often responsible for identifying grass height as an important driver of nest success. Together these studies suggest that the common practice of measuring grass height around nests directly following nest failure or hatch can lead to a false positive signal that indicates grass height is correlated with nest success even when they are unrelated. This is because hatched nests are measured later in the season than failed nests, which gives grasses more time to grow.

The newest study's authors re-evaluated more than 800 nests from several studies that originally showed a positive correlation between nest success and grass height. After correcting the data to account for grass growth, researchers found no relationship between grass height and nest fate, confirming a sampling bias in two of three re-analyzed datasets, and a reduced but still significant association in the third. Following correction, median grass heights at hatched and failed nests were within 0.05 inches of one another (the thickness of a penny) across all re-analyzed datasets.

These findings suggest that the height of grass may not be as crucial to sage grouse nesting success as previously thought. Researchers recommend that field sampling methods be adjusted to ensure unbiased measurement of grass height at predicted hatch date, and that site-scale habitat management guidelines that include grass height as an indicator of nesting habitat quality be revisited.

Is Grass Height Necessary For Nest Concealment?

A long held tenet of sage grouse nest ecology is that dense, tall grasses and forbs will help conceal nests from predators and will result in increased nesting success. This hypothesis has focused attention on managing grazing to ensure adequate hiding cover during nesting season. Past research on factors contributing to nest success seemed to confirm this positive association.



Researchers recommend waiting to measure grass height until after the predicted hatch date for all nests. Photo by Joe Smith.

Waiting to measure grass height near hatched nests until later in the growing season results in biased data collection methods.

However, a 2016 study of nest sites in Nevada by Dr. Dan Gibson and colleagues at University of Nevada-Reno suggested that the correlation between grass height and nest success could instead be due to a built-in bias in timing of when vegetation is measured around hatched and failed nests. If habitat measurements are made immediately after researchers determine fate of a nest (either failure or hatch), measurements may be taken weeks later at successful nests than at failed nests, which allows grasses more time to grow. Because the nesting season occurs in the spring during green-up – when grasses can grow more than a half an inch a week – it appears that hatched nests are surrounded by taller grass. Dr. Gibson’s study suggested this timing bias is the reason that so many studies have concluded that tall grass is important for concealing nests from predators.

Looking Deeper Into The Grass

To further test this hypothesis, Joe Smith at University of Montana re-analyzed data from three independent studies that previously showed a correlation between grass height and nest success. Smith and his team reevaluated data from studies in the Powder River Basin of southeast Montana and northeast Wyoming, Smith’s own research in central Montana, and a site in northeast Utah. When combined with Gibson’s research in Nevada, the studies encompassed 1,204 sage grouse nests over 24 study site-years from across the range of sage grouse. The goal was to determine if results of these studies might be different when accounting for the biased methods.



New findings show that it’s more accurate to measure grass height for all nests – failed or hatched – at the predicted hatch date.

Photo by Joe Smith.

In Gibson’s study, measurements of vegetation were made at the expected hatch date for all nests, regardless of their actual outcome. This minimized any difference between failed and hatched nests in when vegetation was measured. Gibson then used a linear regression to predict vegetation height at the date of nest fate, simulating the biased methods common in other sage grouse nesting studies. For his study, Smith used the data that was collected at nest fate – the biased way – and applied the reverse correction to obtain grass heights as though they had been sampled using unbiased methods.

Smith found that, when uncorrected, all of the datasets revealed a strong correlation between grass height and nest success. However, following the simple correction to account for bias, there was no longer any association between grass height and nest success in two of the three studies, while the association was slightly reduced in strength but still apparent in the third Powder River Basin. At hatch date, median grass heights at hatched and failed nests were within just 0.05 inches of one another across all re-analyzed datasets. Overall, the research strongly affirmed Gibson’s initial findings and suggests that the height of grass is not nearly as crucial to sage grouse nesting success as previously thought.

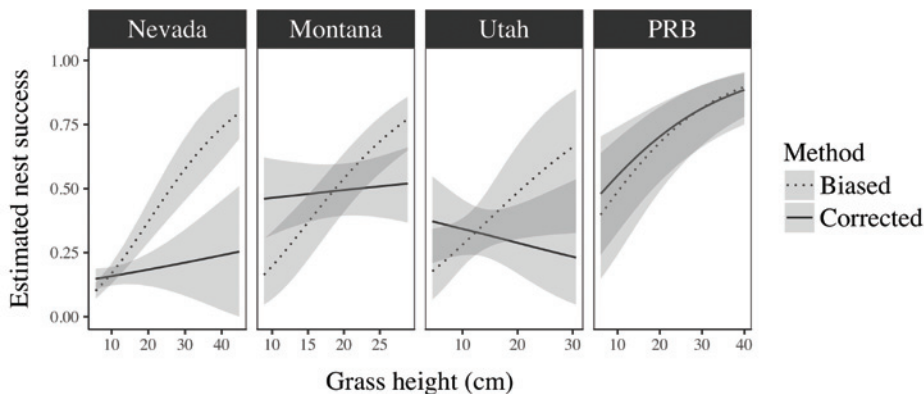


Figure 1. Uncorrected, each of the re-analyzed datasets reveal a strong, positive association between grass height and daily nest survival (dotted lines). Following adjustment of measured grass heights to remove timing bias (solid lines), there was no association between grass height and nest survival in three of the four datasets (the original study by Gibson in Nevada, and the Montana and Utah studies), and a slightly weakened but persistent association in the Powder River Basin dataset.

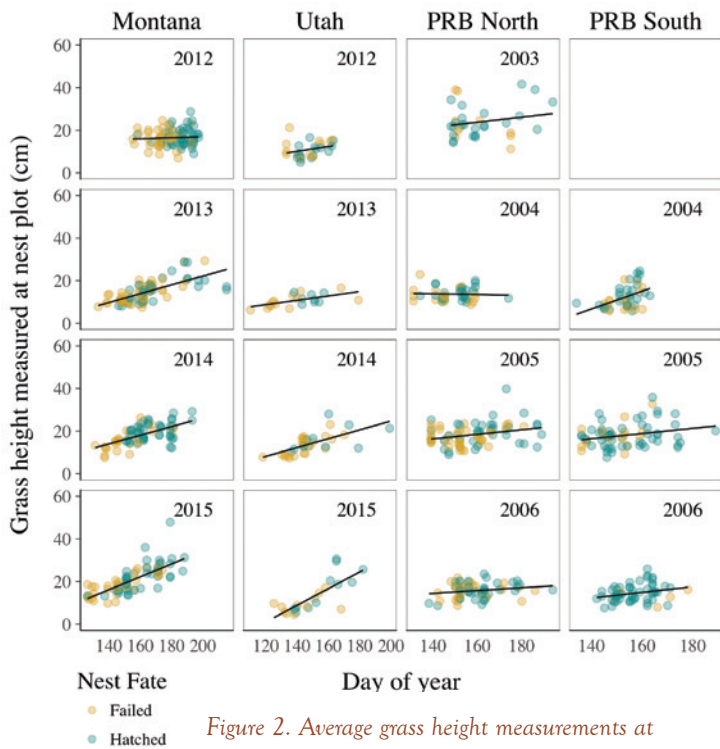


Figure 2. Average grass height measurements at successful and failed sage grouse nests (n = 808; Nevada data not depicted). After correcting for grass growth, grass height was similar between successful and failed nests.

Key Takeaways for Research and Management

Good rangeland management remains key to conservation, but grass height does not appear to be a universal indicator of nesting habitat quality for sage grouse. The key takeaway for researchers is to reduce the likelihood of biased results by waiting to measure grass height until after the predicted hatch date for nests. Measuring vegetation as quickly as possible after the incubating female has left the nest should be avoided (currently a common practice among nesting studies of sage grouse and other ground nesting birds).

In addition, Smith's findings should encourage a critical re-evaluation of habitat management guidelines that are based on research now known to have inadvertently used biased methods. Native grasses and forbs are key components of healthy sagebrush rangelands and high-quality sage grouse habitat, but the importance of tall grass for concealing nests from predators has likely been overstated. Furthermore, depending on weather conditions, micro-habitat factors like grass height can fluctuate wildly from year to year making them difficult metrics for basing management decisions.

At the same time, Smith recognizes that while grass height might have a limited effect on nest success, cover and height of grasses and forbs may affect other important parts of the sage grouse breeding cycle such as brood-rearing. Limited studies that have tested for these effects have produced mixed results. Additional research is clearly needed to inform vegetation and grazing management in sage grouse habitat, but Smith's team is quick to point out that what makes for good habitat in one place may not be universally applicable, and best management practices may differ from one region to another.

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New Findings Provide Added Flexibility For Ranchers

While getting the science right on grass height may challenge long-held perspectives about the role of grazing and grass height in sage grouse habitat management, it also may provide added flexibility for managers to work together with ranchers to achieve overall ecosystem goals in the face of increasingly complex and persistent threats. Smith and colleagues caution not to interpret their findings to imply that grazing does not matter. Rather, they suggest fundamental, time-tested range management principles be employed as a tool to ensure sage grouse and other wildlife have the resources they need.

These new findings provide an opportunity for scientists and managers to set down our rulers, step back, and look at the bigger picture. By promoting robust and diverse native perennial plant communities, managers can ensure that rangelands remain resistant and resilient so that drought, exotic annual grass invasions, and catastrophic wildfires are less likely to impact birds. Done sustainably, ranching is a highly compatible land use for supporting sagebrush-dependent wildlife, and a preferred alternative to cultivation and housing developments that reduce and fragment the vast landscapes sage grouse need to thrive.



Time-tested range management principles promote diverse and resilient plant communities including native grasses, ensuring sage grouse and other wildlife have the resources they need. Photo by Brianna Randall.

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Source

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Additional Resources

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Please Cite As

Sage Grouse Initiative. 2017. Taking the Bias Out of Grass Height Measurements. Science to Solutions Series Number 15. Sage Grouse Initiative. 4pp. sagegrouseinitiative.com/taking-bias-out-sage-grouse-nesting-studies.

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October 2017

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