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Longer Term Rest from Grazing: A Response to Jones & Carter

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Abstract

Jones & Carter, in a response to Davies et al. (2014), misrepresent the original article and other articles, develop arguments not supported by scientific literature, and ignore literature counter to their opinions. Most peculiarly, Jones & Carter incorrectly assert that Davies et al. concluded 1) livestock grazing is benign in sagebrush steppe and 2) long-term rest is not beneficial. To the contrary, Davies et al. repeatedly stated that improperly managed grazing negatively impacts sagebrush communities and that long-term rest is clearly advantageous over improper grazing. Jones & Carter ignore peer-reviewed scientific journal articles that demonstrated properly managed grazing can reduce fire behavior and severity, decrease native bunchgrass fire-induced mortality, reduce post-fire exotic annual grass invasion, and mediate the negative effects of fire on soil biological crusts in intact sagebrush communities. They also make the common mistake of confusing legacy effects of past mismanagement with current management effects, and attempt to build an argument for large grazing-free areas in the sagebrush ecosystem based on this misperception. However, grazing is one of only a few tools, and possibly the only one that can be applied at the scale needed, to mediate the effects of climate change and an increased risk of frequent fires in the sagebrush ecosystem. Therefore, counter to Jones & Carter's suggestion that we need large grazing-free areas, we instead need large areas representing different grazing management to improve our understanding of how grazing can be most effectively used to protect the sagebrush ecosystem from catastrophic frequent wildfires.

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Editor's Note

This is a reply to a response article by Jones and Carter which was written to address "Implications of longer term rest from grazing in the sagebrush steppe," by Davies et al., published in this journal in 2014.

Original article:
Davies, K.W., Vavra, M., Schultz, B. & Rimbey, N. (2014). Implications of longer term rest from grazing in the sagebrush steppe. Journal of Rangeland Applications 1, 14-34. [link]

Response:
Jones, A. & Carter, J. G. (2016). Implications of longer term rest from grazing in the sagebrush steppe: an alternative perspective. Journal of Rangeland Applications 3, 1-7. [link]

Introduction

Jones & Carter (this issue; 2016) misrepresent Davies et al. (2014) and develop arguments that are not supported by rigorously peer-reviewed scientific literature. They also do not cite recent literature that is counter to their arguments. They incorrectly state that Davies et al. concluded 1) that livestock grazing is benign in sagebrush steppe and 2) that long-term rest is not beneficial. Davies et al. repeatedly asserted that improper grazing negatively impacts sagebrush communities and even stated in the abstract "Longer term rest is clearly advantageous to detrimental grazing practices". This is a contradiction to both claims by Jones & Carter. They also take individual statements out of context and ignore the larger discussion supported by multiple peer-reviewed scientific journal articles. In an attempt to maintain brevity, we only address some of the most critical issues below.

Dormant-Season Grazing

Jones & Carter argue that dormant-season grazing negatively impacts ecosystems. However, recent research (Davies et al. 2016a) demonstrated that five years of dormant-season grazing did not negatively impact sagebrush communities. Other work has demonstrated compositional shifts from exotic annual grass to perennial grass (Schmelzer et al. 2014) and reductions in fire risk (Davies et al. 2015, 2016b) with well-managed dormant-season grazing. Jones & Carter appear to incorrectly assume that Davies et al. suggested that all residual vegetation be removed based on their arguments against dormant-season grazing and their suggestion that utilization needs to be up to 80-90% to influence fire. In fact, fire size, intensity, and behavior in sagebrush communities

were greatly reduced with 40-60% utilization with dormant-season grazing (Davies et al. 2016b).

Sagebrush-Bunchgrass Co-Dominant Plant Communities

Davies et al. stated that sagebrush-bunchgrass co-dominated plant communities have the required vegetation composition for resilience; thus, long-term rest will not achieve notable changes in plant community composition. Jones & Carter claim that this "appears to imply that these systems always have the species composition and productivity of their natural state". Contrary to this statement, Davies et al. 2014 simply suggested that long-term rest will not change the resilience of these co-dominant communities as major plant functional groups critical for resilience are present, and ample literature (cited in Davies et al. 2014) demonstrate few vegetation differences between well-managed grazing and grazing exclusion.

Accusations of Mis-Citation

Jones & Carter make the broad statement that "citations that Davies et al. choose to support their arguments are often not supportive of their case". Yet, they provide only two examples that are inconsequential to the overall conclusions of the synthesis and, in fact, lend support to Davies et al.'s statements. Jones & Carter state that the claim by Davies et al. that exotic annual grass can invade ungrazed areas is not supported by Svejcar & Tausch (1991) whose study area (Anaho Island) was ungrazed for approximately a century. First, Svejcar & Tausch (1991) was one of two citations for this statement, not a stand-alone citation. Second, Svejcar & Tausch (1991) reported that there was no record of Anaho Island being grazed since the turn of the century; however, prior to the turn of the century a few goats were found on the island. Furthermore, other work at ungrazed and physically protected (from grazing) kipukas clearly shows cheatgrass can become established on ungrazed rangeland (Tisdale et al. 1965; Kindschy 1994). Their second example states that Davies et al. cite Manier & Hobbs (2006) as an example of grazing exclusion decreasing biodiversity and net primary production (NPP), but that Manier & Hobbs didn't measure NPP. However, Manier & Hobbs (2007) measured NPP and it was greater in grazed treatments. Davies et al. made an oversight by only citing the 2006 and not both the 2006 and 2007 journal articles by Manier & Hobbs.

Jones & Carter state that Davies et al. did not mention that Fox & Eddleman (2003) found litter/moss/lichen increased from 30.7% to 55.9% and juniper remained unchanged in the absence of livestock grazing. This statement implies that Davies et al. chose to not include relevant information. Their statement is misleading as this was the change over a 30-year period of only one plant association. The other association evaluated by Fox & Eddleman doubled in juniper cover, and litter/moss/lichen cover did not differ over that 30-year period. Furthermore, Fox & Eddleman found juniper cover approximately doubled in all associations from 1944 to 1995.

Rest Influence on Soil Biological Crust

In the discussion of soil biological crusts (SBC), Jones & Carter once again misrepresent Davies et al. by suggesting that they are downplaying effects of grazing. Jones & Carter suggest grazing is much more destructive to SBC than Davies et al. implied for sagebrush steppe based on one study in a blackbrush community (Jeffries & Klopatek 1987) and two pieces of grey literature (Marble 1990, Kaltenecker et al. 1999). In contrast, Davies et al. arguments are supported by multiple peer-reviewed scientific journal articles. In addition, recent research (Davies et al. 2016c) found that well-managed grazing mediated effects of fire on SBC with pre-fire grazed areas having >2 times the cover of SBC than ungrazed areas two decades post-fire. The relationship between livestock and SBC is more complicated than, and sometimes opposite from, what is being suggested by Jones & Carter. Furthermore, in the section about soil, Davies et al. state "long-term rest may be quite beneficial to soils as compared to heavy livestock grazing". Clearly, this is not "downplaying" the effects of livestock grazing on SBC or soils.

Jones & Carter then attempted to dismiss exclosure studies because SBC may have been already reduced prior to exclosure construction. The intent of the synthesis by Davies et al. is to examine the effects of

longer term rest, which obviously occurs in exclosures, not to evaluate the effects of never being grazed.

Rest-Fire Interactions

Jones & Carter's arguments against grazing to modify fire in sagebrush-bunchgrass communities is based on the erroneous assumption that historical disturbances (i.e., fire) produce the same effects they did prior to European settlement, climate change, elevated CO_2, and introduction of exotic species. A cursory evaluation of the literature on the grazing-fire interaction reveals that ungrazed compared to grazed intact sagebrush communities can be at greater risk of burning, experience more complete burns, have more extreme fire behavior, and suffer greater mortality of native perennial bunchgrasses leading to post-fire exotic annual grass invasion (Davies et al. 2009, 2010, 2015, 2016b, c) and that similar effects occur in other ecosystems (e.g., Waldram et al. 2008; Kimuyu et al. 2014).

Implications for Wildlife

Jones & Carter pull one statement out of context from Davies et al. that states "long-term rest from grazing may also negatively impact the diversity of wildlife because the composition and structure of the vegetation of the ungrazed landscape can be rather homogeneous, particularly on landscapes that lack physiographic diversity". This statement is part of a larger discussion supported by scientific literature that compares and contrasts potential effects of long-term rest on wildlife. Jones & Carter jump to several illogical and unsupported conclusions, including the suggestion that Davies et al. claim that sagebrush steppe in its natural state lacks diversity and that native biota of sagebrush steppe relied on grazing in the past. No such all-inclusive statements were made or implied.

Jones & Carter imply that data from Sheldon and Hart Mountain National Wildlife Refuges (NWR) demonstrate removing livestock favored wildlife because sage-grouse and pronghorn increased after livestock removal. There are numerous concerns with this assertion: 1) sage-grouse populations from adjacent grazed areas followed a similar increase during this time period (ODFW 2015); 2) most pronghorn on Sheldon and Hart Mountain NWR spend a significant amount of time (up to half of the year) on adjacent grazed rangelands (Collins 2016); 3) pronghorn populations across grazed rangelands in Nevada increased 53% from 2003 to 2013 (NDOW 2014); and, 4) cause-and-effect cannot be determined from before-and-after observations; inferences are even more limited, as in this case, when observations are neither randomized nor replicated.

Well-Managed Grazing

Jones & Carter attempt to portray Davies et al. as suggesting that all contemporary grazing is well-managed. This is a peculiar claim since one of the key points of Davies et al. is that improving grazing management may confer some of the same benefits as long-term rest. They also assert that Davies et al. did not specify the exact grazing prescription that is considered well-managed. However, well-managed grazing will vary by plant community, site characteristics, grazing animal characteristics, weather, treatment objectives, and other factors. Well-managed grazing also must consider the individual and interactive effects of defoliation intensity, timing of defoliation with respect to plant growth stage, duration the management unit or grazed area is occupied, and the frequency of defoliation in the current plant growth cycle. There is no specific quantitative value for any one factor, let alone all four, or the interactions that can specifically define well-managed grazing for all large landscapes. Furthermore, no discussion about benefits or detriments of grazing has much validity without addressing these concepts and their interactions. Davies et al. deliberately integrated these critical concepts, while Jones & Carter largely ignore them (Table 1). Davies et al. did specify that well-managed grazing should incorporate periods of deferment or short-term rest and limit defoliation during use. Davies et al. also specified some criteria of what would not be considered well-managed grazing. In addition, there are general guidelines for well-managed grazing that can be found in any basic rangeland ecology textbook. Furthermore, as ecologists generally know, monitoring and adaptive

management are critical to any natural resource management plan as these are dynamic systems.

Conclusions

Jones & Carter consistently misrepresent Davies et al. with arguments largely not supported by published peer-reviewed empirical research. Their call for establishing large grazing-free landscapes to "better understand the impacts of livestock grazing" is an attempt to dictate management (i.e., stop grazing) without having scientific evidence to support this management decision, and ignores that we already have large ungrazed landscapes (e.g., Sheldon and Hart Mountain NWRs). Jones & Carter also misrepresent other literature to support their arguments (e.g., Fox & Eddleman 2003). Jones & Carter also often appear to conflate the effects of past mismanagement with current management in their claims of detrimental effects of grazing. Undeniably, improper grazing still occurs; however, the claim by Jones & Carter that sustainable utilization is the exception to the rule is not supported by peer-reviewed scientific literature. This unsupported claim, misrepresentation of scientific literature, and ignoring literature counter to their arguments highlights some of the issues with the Jones & Carter's article.

Table 1. The number of times important concepts (intensity, timing, duration, and frequency of being grazed) for understanding and explaining the effects of grazing management, its absence, or its removal are used by Davies et al. (2014) and Jones & Carter (2016)[a]. Words or phrases under each basic concept were used as descriptors in the text to explain the primary concept (in bold).

Terms Related To The Effects From Grazing	Davies et al.	Jones & Carter
Intensity	7	0
Light use/grazing	4	4
Moderate use/grazing	18	1
Heavy use/grazing/stocking	6	0
Intense use	2	0
Excessive use/grazing	1	0
Timing of use	8	0
Spring grazing	4	0
Growing season	9	1
Dormant season	8	2[b]
Fall grazing	2	0
Deferment	5	0
Seasonally controlled grazing or season of grazing	3	0
Duration	5	0
Season-long	4	0
Continuous	3	0
Longer (grazing) season	1	0
Periodic rest (one year or growing season)	2	0
Frequency	1	0
Repeated defoliation	2	0
Repeated grazing	2	0
Total	97	8

[a]Note: Davies et al. was 21 pages in length. The response article by Jones & Carter (2016) was restricted to 3,500 words and was 6 pages in length.
[b]One use was in a quote extracted from Davies et al. 2014 and the other in the discussion of the extracted quote.

Common and Scientific Names of Plants Listed in Text According to the USDA PLANTS Database (http://www.plants.usda.gov/).

Common Name	Scientific Name
Blackbrush	*Coleogyne ramosissima* Torr
Cheatgrass	*Bromus tectorum* L.
Juniper	*Juniperus occidentalis* Hook
Sagebrush	*Artemisia* species L.

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