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District Ranger Amy Ormseth
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Dear Ranger Ormseth:

In December 2017, the Council for the Bighorn Range (CBR) was invited by the ranch manager of a Tongue Ranger District grazing permittee to participate in a proposed collaborative group of stakeholders representing different viewpoints to assess the use of the modified Robel pole on the Bighorn NF. As explained, the goal of the project was to review 3-5 years of data collection (to be led by Dr. Derek Scasta, University of Wyoming (UW)), and then make recommendations to the Forest Service (with the understanding that any recommendation would serve to advise the deciding officer). The CBR responded to the ranch manager with a letter requesting additional information regarding the stakeholders involved and specifics as to why the monitoring program based on the modified Robel pole model developed by Uresk and Juntti that had been in use on the Tongue Ranger District for approximately 12 years was unsatisfactory or was in need of revision. The CBR received a response within an hour saying he did not agree with our point of view and wished our group the best of luck. Although they called themselves a collaborative, turns out anyone who did not agree with their biased agenda was not welcome to be a part of their group.

The CBR looked for additional information concerning this proposed study in documents received through FOIA requests over the next few years. We were given some preliminary documents and a copy of the Monitoring Plan but received no additional information once technicians started gathering information in the field. This was surprising since we knew Dr. Scasta made at least one trip to Sheridan to present information to the Sheridan County Conservation District and Tongue District permittees but apparently, he did not extend the same courtesy to the Bighorn NF.

The CBR recently learned that a paper titled “Refining Rangeland Management for Grazed Idaho Fescue Grasslands in the Big Horn Mountains, Wyoming” by R. Benjamin, B. Stam and J.D. Scasta was published in *Rangeland Ecology and Management*, Volume 83 (2022) pages 161-174. Although CBR was eliminated from being a part of the collaborative group involved in this study we have carefully reviewed the many documents we have received in years of FOIAs showing much of the history of grazing on the Tongue Ranger District and the Benjamin et al. paper and have identified several issues/concerns and questions with the range management program on the Tongue Ranger District in future years.

Issue 1: The management direction outlined in the Tongue AMP, including the allowable use guideline, was never designed to maximize livestock grazing but to provide for a sustainable amount of grazing while moving the rangeland resources towards the desired conditions and still provide for the needs of other multiple uses on the same public lands.

CBR Analysis: The Multiple Use Sustained Yield Act of 1960 directed the Secretary of Agriculture to develop and administer the renewable resources of timber, range, water, recreation, and wildlife on the national forests for multiple use and sustained yield of the products and services. Multiple Use was defined as the "management of all the various renewable surface resources of the national forests so that they are utilized in the combination that will best meet the needs of the American people". The American people not only includes the grazing permittees and other agricultural interests but also the general public who utilize these lands to hike, camp, hunt, fish, ride ATVs, enjoy the aesthetic views on a pleasure drive, or a municipality that utilizes rivers to provide drinking water to its residents to name a few. The act defined sustained yield as "the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the national forests without impairment of the productivity of the land". Through the Tongue AMP the Tongue District set forth management to provide for livestock grazing as well as set a guideline of how much residual vegetation that must be left at the end of the grazing season to provide for all these other uses at a reasonable and sustainable level. The fact that the downward trend in vegetative conditions has been reversed (see Issue 3 below) and the overwhelming majority of the long-term monitoring is showing both the uplands and riparian are moving towards desired conditions described in the Tongue AMP (but have not yet fully met) is a strong indication that the residual guideline is where it needs to be to sustain productivity and meet the needs of many of the competing uses for those lands.

Issue 2: Rangeland monitoring on the Tongue District strongly shows that livestock grazing under the Tongue AMP is in compliance with: 1) 2005 Bighorn National Forest Land and Resource Management Plan (aka Forest Plan), and 2) 2005 and 2007 versions of the Bighorn National Forest Vegetation Grazing Guidelines (aka Vegetation Grazing Guidelines).

CBR Analysis: The Forest Plan gave management direction that stated desired plant communities for rangeland vegetation were to be identified during the site-specific environmental analysis completed

during the allotment management planning process. It also gave further direction to manage vegetation to allow for successional progress towards those desired communities. The Forest Plan then defined satisfactory condition as meeting or moving towards desired vegetative conditions and unsatisfactory as not meeting or moving towards desired vegetative conditions or undetermined. Based on experience on the ground the Forest's range personnel included language in the Vegetation Grazing Guidelines that planning grazing periods around the physiological needs of the plants and meeting VOR guidelines (band 5 with Band 4 acceptable) would allow uplands in satisfactory conditions to maintain those conditions and areas in unsatisfactory conditions would most likely improve to satisfactory. The long-term monitoring discussed in Issue 3 below clearly shows that grazing management on the Tongue District since 2005 is not only allowing the plant communities to move towards the desired conditions outlined in the Tongue AMP but has also met the management direction of the Forest Plan and expected results outlined in the Forest Plan and Vegetation grazing Guidelines.

Issue 3: The Tongue Ranger District has not only relied on annual monitoring using the modified Robel pole to determine if livestock grazing levels were appropriate with the management direction outlined and implemented under the Tongue AMP since 2005. Long term trend monitoring in both the uplands and riparian areas has occurred on a regular basis since the early 2000's.

CBR Analysis: Parker 3-Step transects were established on upland range sites in nearly all the grazing allotments included in the Tongue AMP in the 1950's and early 1960's. Pre-planning efforts for the Tongue AMP FEIS included locating and reading these transects during the 2002 grazing season. Data from approximately 68% (28 of 41) of the transect clusters showed a downward trend at that time. The Tongue AMP was signed, and management direction implemented in 2005. This direction included changing short-term or annual monitoring from traditional utilization to the modified Robel pole in the uplands along with Carex stubble height in the riparian. The permitted stocking on most of the Tongue allotments was adjusted based on the first 4 years of that monitoring in 2009. The modified Robel pole and Carex stubble height has been used for annual monitoring since that time to determine when allowable use guidelines have been met and when livestock should be removed from a pasture. More importantly, the Parker transects continued to be read on a periodic basis. The District also established over 160 photo points (riparian and aspen) across ten allotments and have revisited all periodically to retake photos and compare changes in vegetation and stream channels. In addition, the Forest ecologist established riparian cross section transects (Winward, 200 GTR-47 Ogden, UT) in six locations and District have also made the efforts to re-read those transects approximately every 5+ years since the Tongue AMP was signed in 2005. Approximately 90% of the Parker clusters, photo points and cross section transects have shown a positive change or upward trend in vegetative conditions since the management direction of the Tongue AMP was implemented in 2005. Based upon all this long-term monitoring, the Tongue District has determined the management direction of the Tongue AMP is causing the rangeland resources to move towards desired conditions and only needs occasional minor annual tweaks in specific areas to keep the upward trend to reach desired conditions sometime in the

future.

Issue 4: The current use of the modified Robel pole on the Bighorn NF came as a recommendation from range specialists at the University of Wyoming (UW).

CBR Analysis: Appendix H of the Tongue Allotment Management Plan (AMP) summarizes over 500 observations of use documented by Forest Service personnel from 1997-2003. Only 1 in 2 or 50% of these observations indicated the grazing levels met the allowable use guidelines outlined in the permittees Annual Operating Instructions (AOI). Permittees did not always agree with Forest Service measurements, so an effort was made, particularly by one family, to seek the assistance of range specialists from the UW to look at measurements on their allotment and help assess the overall situation. Following a review on the ground UW indicated that utilization measurements can be influenced by many factors, and it is more difficult to recognize and measure how much forage was removed from variable levels of annual production versus measuring the herbage that remains at the end of the season. They, therefore, recommended the Forest consider using a residual guideline that would be more recognizable and not vary from year to year so, in theory, more easily met by the permittees. It was at that time that Uresk and Juntti were asked to calibrate the modified Robel pole to the specific vegetation type found on the northern areas of the Bighorn NF. The Tongue AMP used the model developed by Uresk and Juntti (2008) to set allowable use guidelines based on residual vegetation and has used these guidelines since 2005. Some permittees are still not satisfied with the residual guidelines and/or results of the post grazing monitoring on their allotments, and a few, led by the same family as before, have once again contacted UW range specialists to find relief from these guidelines. The study completed by Benjamin et al. is in direct response to that second request.

Issue 5: Benjamin et al. and Uresk and Juntti used entirely different procedures for site selection for the collection of data to be analyzed in their studies. The Benjamin et al. sites were highly selective and only found on pastures within allotments grazed by permittees actively involved in the initiation of their study.

CBR Analysis: Benjamin et al. collected all their data on 12 sites selected within 11 of approximately 70 pastures grazed by cattle on the Tongue District. As a result, the Visual Obstruction Readings (VOR) in bands observed (1 band = 0.5 inch or 1.27 cm) were restricted to the vegetation found on those sites. This limited readings to a similar band range of the modified Robel pole all three years of data collection and there was not a concerted effort to obtain VOR data in the very low range (less than Band 2). Benjamin also claims all sites were identified through a collaborative process with UW Extension range specialists, permittees, and Bighorn NF staff. It is our understanding, the pasture location had already been selected by UW and permittees and the BNF staff was only contacted to identify key areas where Tongue District personnel had previously taken modified Robel pole readings within the preselected pastures.

In contrast, Uresk and Juntti used a stratified random sampling design so that a range of standing

vegetation from short to intermediate to tall were sampled. Data were collected from 131 different sites that were randomly located across the northern half of the Bighorn NF (Tongue and Medicine Wheel Districts) below 9200 feet in elevation within 3 identified strata of the modified Robel pole (0-5 VOR bands, 6-10 VOR bands and 11-15+ VOR bands).

Issue 6: The statistical analysis completed for the Benjamin et al. paper showed the linear regressions when using the VOR to predict residual herbaceous biomass in kg/ha had an R squared values of 0.39 – 0.45 when evaluated on individual years of the study and an R squared of 0.52 when all three years were combined.

CBR Analysis: R squared values show how well the regression model explains the observed data, or in other words how well the regression is a “goodness of fit” to the data. An R squared value of 0.5 indicates that 50% of the variability in the target variable cannot be explained by their regression model. In this case, the regression models shown by Benjamin et.al. at best cannot explain 48% of the variability in their data (when all three years of data are combined) and 55-61% of the variability cannot be explained when each year is analyzed on its own. As a result, the Benjamin et al. models are very poor predictors of residual biomass at the end of the season. Because 48-61% of the variability cannot be explained a reading indicating a key area was grazed at a level equal to or near an allowable use guideline would be at best questionable, and in reality, the key area could be heavily grazed. The original modified Robel pole model presented by Uresk and Juntti had an R squared value of 0.81 meaning data collected using their protocol successfully explained 81% of the variability in the residual vegetation being measured. In addition, if the data collected indicated the overall VOR was less than the allowable use guideline, a one-sided t-test could be applied using field data recorders while still on site where data was collected. This analysis would evaluate the variability of the site specific data to determine with a 95% reliability that the average VOR (with 4 or 5 transects) was indeed less than the allowable use guideline stated in the permittee’s Annual Operating Instructions. This is nearly twice the reliability offered by the Benjamin et al. model. Most natural resource monitoring methodologies, including others shown in the R2 Range Analysis Handbook, typically offer reliability in the 70-80% range. The Uresk and Juntti model, calibrated to the specific vegetation type on the Bighorn NF offered a more precise monitoring tool than the Tongue Ranger District, or other Forest Ranger Districts, had available previously.

Issue 7: Figure 4 shows the Benjamin et al. Y intercept values are different for each of the 3 years when compared to the Uresk and Juntti values used to estimate kg/ha of residual herbage at the end of the grazing season. (Note formula used for estimation is: $Y \text{ intercept} + \text{band reading} \times \text{kg/ha per band} = \text{residual}$). They compared their regression models at band 5 versus Uresk and Juntti at band 5. All their regression models at band 5 range from 140.4 to 546.4 kg/ha more residual herbaceous biomass than the Uresk and Juntti model. The Benjamin paper also states there appears to be a bias of lower values in Uresk and Juntti original assessment when compared to their data collected from 2018-2020, particularly for visual obstruction readings <2 bands.

CBR Analysis: Examination of Figure 4 in the Benjamin et al. paper, it becomes obvious the 12 highly selective sites sampled by Benjamin et.al. did not have the full range of VORs from the low to high that were represented by the Uresk and Juntti model. In particular, Benjamin et al. lacked VOR readings between 0 and 2 bands. This and using different data analysis procedures (see Issue 8 below) resulted in higher regression intercepts on the Y axis for all three years of their study. Together, these two major differences translated into higher kg/ha estimates of residual herbage than reported by Uresk and Juntti.

Instead of sampling areas with these low VORs Benjamin et al. claim Uresk and Juntti may have mischaracterized the environment by sampling areas with low VORs (especially <2 bands). They also attempt to make the case that instead of actually sampling areas with <2 band VORs to have a direct relationship of residual biomass to the lower bands, they can use a regression analysis with weak R squared values (see Issue 4 above) and thus weak predictors of the kg/ha of residual herbage, to estimate residual biomass and presume the actual biomass could be substantially more than predicted by the Uresk and Juntti model that actually measured those values and included the results in their regression analysis.

Benjamin et al. also infers that since they did not measure transects with VORs less than 2 bands on the 12 sites included in their study, that vegetative conditions may have changed (although they offer no proof of such change) since 2008 and the Uresk and Juntti model may no longer be an accurate representative of vegetative conditions on the Tongue District.

Uresk and Juntti sampled 131 sites using a stratified random design across the Tongue RD represented by the Idaho fescue vegetative type (on sedimentary soils) and evaluated the residual herbage from transect readings ranging from 0.2 to approximately 18 bands. The fact Benjamin et al. only sampled approximately one-tenth of the number of sites with repeated measurements and their failure to sample and evaluate the full range of VORs represented on the modified Robel pole explains a large part of the reasoning why their models had low R squared values and thus weak prediction estimates for residual biomass in kg/ha.

Issue 8: Benjamin et al. states all their data were collected on the same 12 sites for all three years of their study. A review of Figure 4 of their final paper shows a great number more than 12 data points were used in their regression analysis. It is not known how Benjamin et al. used the data to complete their analysis, but it did not follow the same procedure used by Uresk and Juntti or other researchers when analyzing data collected by various versions of the original Robel pole (Robel et al. 1970 Journal of Range Management).

CBR Analysis: Previous Robel pole papers, including Uresk and Juntti, averaged all VOR readings and clipped herbage data by transect before completing their regression analysis. More importantly, only one set of data was used for each of the 131 sampled sites. If Benjamin et al. had used the same procedure to analyze their data, the graphs in Figure 4 would only have 12 points. Using repeated measurements or multiple sets of data from the same site, even though collected at different times during the summer, is known as pseudo-replication and is not appropriate for this type of regression

analysis. A repeated measures analysis is the only proper way to analyze data collected in this manner. Reviews by other statisticians we have contacted have determined that the statistical analysis completed for this paper was not properly done and results are simply not applicable.

Based on the issues/concerns stated above, the CBR has several questions for the range managers on the Bighorn NF:

1. What was the primary reason for the Benjamin et al. study? As explained in the beginning of this letter the CBR is under the impression it was organized by unhappy grazing permittees and the University of Wyoming but were there any specific resource related questions that the Bighorn NF felt needed answered?
2. In a May 2, 2018 letter to Dr. Scasta, (less than 2 months before data collection started) District Ranger Ormseth stated the monitoring proposal submitted by Dr. Scasta was not favorable to acceptance by the Forest Service as "like science" upon completion of the study. The letter went on to say the results from the methods in this proposal would not be comparable to the Robel pole methodology currently in use on the Bighorn NF. Has the opinion of the Bighorn NF changed from this position since the study results have been published? And if the status has changed, what specific changes were made to make this study acceptable as "like science"?
3. It is our understanding there is a research branch within the Forest Service organization. Has the Bighorn NF asked your own scientists to review this study to determine if the data collection and statistical analysis is "like science" to the Uresk and Juntti model currently being used? If not, why not, and if you have, what were the opinions of those researchers?
4. Is the Bighorn NF considering any changes to the administration of the range management program based upon the results of this study? If any changes are proposed, what are the specific resource-related concerns (vegetation, soil, water, wildlife etc.) that led to a decision to make a change.
5. Is the Bighorn NF considering any changes to the monitoring protocols (both short term/annual and long term/trend) currently in use in the range program as a result of this study or other resource related reasons? If so, please explain the proposed change and how any change will still provide continuity to the protocols (and results) that have been used the past 20+ years.
6. The general public had an opportunity to comment on the current management direction during the NEPA process completed for the Tongue AMP before a Record of Decision was signed. If there are any proposed changes to grazing management (other than minor annual adjustments to a specific area) on any or all the allotments within the Tongue AMP will the public have a chance to comment on those changes prior to them being implemented?

The CBR supports the current range management direction on the Tongue Ranger District and strongly urge the Bighorn NF to continue current management until the desired resource conditions (both upland and riparian) outlined in the Tongue AMP are fully met. We look forward to receiving your response to the issues and questions above.

Sincerely,

Rob Davidson,

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January 25, 2023

Cc: Clint Kolarich, Acting Forest Supervisor

Western Watershed Project

Forest Service Employees for Environmental Ethics

Wyoming Wildlife Federation

Bighorn Audubon Society – WY

Wyoming Game and Fish – Sheridan

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