

USU Extension Grant – Final Report

Project Leader: Dr. Kristin Hulvey

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Project Title: Using grazing systems to manage ecosystem services on Utah rangelands

Beginning Date and End Date: June 1, 2015- May 30, 2016

Total Requested: \$10,000

Project Objectives: This project investigates how two commonly employed grazing systems – continuous vs. rotational, affect the production of ecosystem services in Utah rangelands. Ecosystem services are the benefits people get from nature, and in this study we examined how these two grazing systems effect the ecosystem services of: forage production, riparian health (via water quality metrics), and habitat for sage-grouse. Project objectives include:

- (1) Quantify how continuous vs. rotational grazing systems affect livestock distribution at the landscape scale
- (2) Determine how different grazing systems affect provision of ecosystem services

Project Results: Outcomes: Since June 2015, we have made progress toward both of our project objectives. For Objective 1, this entailed putting satellite collars on 25 cows at each of our two sampling sites (BLM Sage Creek allotment & Deseret Land and Livestock Ranch). These collars collect position data every two minutes continuously throughout the grazing season (~late April to Oct). This was successfully achieved in coordination with research collaborators at the Utah Grazing Improvement Program (UGIP) and local stakeholders who own the collared cattle. These collars were removed from the cattle on Oct 9th and the data from these collars was initially analyzed by a graduate student on the project.

From these data we learned that cattle in both the ‘continuous turnout system’ and the ‘rotational system’ disproportionately use riparian areas. This is an interesting and substantial finding. In the grazing literature, rotational systems are often credited for increasing range health by encouraging uniform utilization of rangelands (Savory 1988; Bailey and Brown 2011). Our initial cattle collar analysis (Davis, unpublished) indicates, however, that this is not the case in our Rich County, Utah system. Rather, we found that cattle in both grazing systems still tend to congregate in riparian areas. This means that differences in riparian health in the areas managed via ‘continuous turnout’ vs. ‘rotational’ grazing systems is not due changing *where* cattle graze in landscapes – i.e. riparian vs whole pastures, but rather to the different duration of use between systems – i.e. changing *for how long* cattle graze in particular areas of the landscape. The duration of use is much shorter in the rotational system compared to the continuous turnout system. In particular, in the continuous turnout system, cattle are allowed to remain in the riparian during the whole grazing season (~May 15- Sept 15), while in the rotational system, cattle are moved from pasture to pasture every two weeks. Such difference in duration of use leads to different recovery times for riparian areas in these two systems (more recovery in

rotational systems). Such recovery is likely a pivotal factor in maintaining healthy flows of ecosystem services.

For Objective 2, we collected plant composition data at both sampling locations, stratifying by a range of abiotic factors so that data could be compared across sites. Plant composition can be directly tied to all three of our target ecosystem services. To accomplish this data collection, I hired three undergraduate summer interns who lived in field stations near our study sites. I trained the interns on plant identification and field techniques, and together we established a series of 100 data collection transects across our two research areas. We refined the upland range monitoring techniques throughout the season by both working with scientists from collaborating agencies (BLM) and examining our initial collected data, and entered all collected data into digital formats so it is ready to be analyzed.

Initial analysis of cattle use patterns from 2015 data, led to altered collection methods in the 2016 summer field season. We modified our sampling design so as to better link duration of grazing with ecosystem service production. In particular, we included riparian sampling areas and are now also measuring water quality to link different grazing systems to the ecosystem service of clean water maintenance.

Information dissemination: To spread the results of our research, we have presented results at conferences and in stakeholder meetings. We are also working on fact sheets and publications for academic journals.

First, Ben Davis (previous graduate student hired on the project) and Katherine Thomas (2015 field intern) both presented posters at the National Society for Range Management meeting this February in Corpus Christi, TX. The posters were well received. I additionally presented data from the project via an invited talk at the 'All Hands, All Lands' Conference in SLC in March. This conference was attended by rangeland managers working with the BLM, FS, and UGIP, and by researchers from other Universities.

Second, we shared details about our project with stakeholders via two stakeholder meetings in Rich County during the winter of 2016. The first was a meeting with Agency partners and private stakeholders in Rich County. Here, we presented initial results and sought on-the-ground insight from our collaborators regarding these findings. This type of outreach meeting ensures that the research continues to address the questions important to all partners, which ensures results lead to our ultimate goal of improved rangeland management. The second meeting was with one of our largest private partners – Deseret Land & Livestock (DLL). The ranch hired a new grazing manager this year, and the manager (M. Meek) was interested in us presenting our project and initial results to the cowboys, administrative employees, and managers employed by the Ranch. This sort of interaction ensures that the project is well received by the people who see us every day collecting data on their private property. The meeting was successful, and I have followed this meeting up with a number of individual meetings with M. Meeks to update him on our project's progress.

Finally, we are working on spreading our results through various publications. Eric Thacker, Co-PI on the project developed a draft fact sheet focusing on the project and is now refining this draft to be distributed in the Fall of 2016. I am also working with Katherine

Thomas to turn her SRM poster into a paper to be submitted to the journal *Rangelands*. This will be an ongoing project during the summer with projected submission data during the Fall 2016.

Efforts to secure extramural funds: In 2015, we submitted six grant proposals (3 external, 3 internal) and gained \$14,590 of external funding and \$110,000 of internal funding. This year, we gained a \$1,000,000 BLM grant thanks, in part, to the initial research funded by this extension grant. We have also revised and resubmitted a Western SARE (Sustainable Agriculture Research & Education) pre-proposal, and will learn of results in the Fall (\$250,000). Finally, we are currently preparing an USDA-Agriculture and Food Research Initiative (AFRI) Foundational Grant Program to be submitted in July (\$500,000).

Literature cited:

Bailey, D. W., and J. R. Brown. 2011. Rotational grazing systems and livestock grazing behavior in shrub-dominated semi-arid and arid rangelands. *Rangeland Ecology and Management* 64:1-9.
Savory, A. 1988. *Holistic resource management*. Covelo, CA, USA: Island Press. 564 p