

Evaluating an On-Ranch Rangeland Monitoring Program in Nebraska

Authors: M.B. Stephenson, H. Wilmer, R. Bolze, and B. Schiltz

Source: Rangelands, 39(5) : 143-151

Published By: Society for Range Management

URL: <https://doi.org/10.1016/j.rala.2017.08.001>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.



Evaluating an On-Ranch Rangeland Monitoring Program in Nebraska

By M.B. Stephenson, H. Wilmer, R. Bolze, and B. Schiltz

On the Ground

- Rangeland monitoring is an important component of rangeland management.
- The Nebraska Grazing Lands Coalition developed a rangeland monitoring program (RMP) in 2009 to assist livestock producers in monitoring rangelands on their ranches.
- Determining rangeland condition and fulfilling a requirement for conservation incentive programs were the most important reasons livestock producers participated in the RMP.
- Eighty-seven percent of survey participants indicated they had continued monitoring following the RMP and many indicated they had made management changes to their ranches.
- Monitoring is an important part of the adaptive management feedback loop. The RMP provided a resource to train producers in monitoring techniques. More tools to interpret monitoring data and increased follow-up by technicians may help producers better utilize their monitoring data.

Keywords: survey, rangeland monitoring, adaptive management, university extension.

Rangelands 39(5):143–151

doi 10.1016/j.rala.2017.08.001

© 2017 The Society for Range Management.

Rangeland monitoring to evaluate management practices is often taught as one of the basic tenants of sustainable rangeland management.¹ Monitoring fulfills a critical step in an adaptive management feedback loop where objectives are developed; specific management practices are applied; monitoring is conducted to evaluate the effectiveness of the management; and adjustments, based on the monitoring data, are made to

better accomplish the stated objectives. Many university extension and federal and state agencies have recognized the importance of monitoring and developed educational programs to assist livestock producers in gaining rangeland monitoring skills.² However, despite concerted education and outreach efforts, adoption of rangeland monitoring by livestock producers has typically been low because of time constraints, complexity of the monitoring techniques, or lack in understanding or use of monitoring data.^{2–4}

Range and pasture lands cover nearly 46% of the land area in Nebraska and are an important forage resource for the state's range beef cow industry, which in 2017 was ranked fourth (1,920,000 beef cows) in the United States in total number of animals.⁵ Federal and state agencies manage only about 5% of Nebraska's land area.⁶ As a result, conservation and management of most range and pasturelands falls on private landowners. On public lands, documentation of grazing management and monitoring of rangeland condition by livestock producers or land management agency personnel is often necessary for reporting within environmental assessment or agency management documents. Livestock producers grazing on private lands do not have the same requirements to monitor the ecological outcomes of their management practices. However, monitoring provides valuable information on how grazing management practices influence plant species composition, forage production, and rangeland health. Because of the value of monitoring to help producers analyze and document conservation management practices on private lands, federal conservation programs in Nebraska, such as the USDA-Natural Resource Conservation Service (NRCS) Conservation Stewardship Program (CSP), have provided financial incentives to livestock producers for monitoring their rangelands (N. Bishop, NRCS State Rangeland Management Specialist, personal communication October 12, 2016).

The Nebraska Grazing Lands Coalition (NGLC) developed a rangeland monitoring program (RMP) to provide on-ranch, one-on-one technical support to assist livestock producers in implementing rangeland monitoring practices.

The NGLC is a state entity of the National Grazing Land Conservation Initiative that works to assist grazing managers in improving and managing their privately owned grazing lands. The NRCS and other sources provided funding for skilled technicians to visit ranches and train producers on basic monitoring techniques. This approach is different from many rangeland extension and outreach programs that invite producers to a central location for one to multiday workshops. In 2015, the RMP's seventh year, the NGLC board of directors requested an evaluation of the efficacy of the RMP. The NGLC and the University of Nebraska-Lincoln Extension sent a survey to past participants of the RMP with questions focused on identifying the grazing management practices of the RMP participants and questions addressing the goals of the board of directors in evaluating the RMP. Key information solicited included the number of producers who continued monitoring following the training, feedback on the value of the program, and suggestions from past participants on how the program could be changed or improved.

The RMP Program

Between 2009 and 2014, 320 livestock producers voluntarily contacted the NGLC and participated in the RMP. When a producer requested training, a technician trained by the NGLC would coordinate an on-ranch visit. During the visit, the technician assisted the producer in establishing a monitoring site, showed the producer how to collect vegetation data, and discussed current grazing management practices. Producers could purchase a monitoring tool-kit for a minimal fee (\$25). Tool kits included a clipping frame, grazing enclosure, scale, tape measure, clippers, clipping bags, and a meter stick.

The monitoring techniques the technicians demonstrated included estimating forage production with a biomass clip and weigh method; line-point transect to evaluate plant cover and species composition; long-term photo points; and rangeland trend, utilization, and stubble height. Technicians also collected and coordinated the laboratory analysis of soil and vegetation samples to give participants an understanding of soil and forage quality at the time of the training. The technician and producer discussed past management, future goals, and management strategies that could help them reach those goals. This typically included management decisions such as timing of grazing and stocking rate, and/or more complex discussions of rotational, multiherd, or multispecies grazing. The technicians encouraged producers to lead by example and show neighbors how they were using rangeland monitoring and how it had benefited them.

The Survey

Addresses were available for 230 past participants of the RMP (Fig. 1). Surveys were mailed to past participants in January 2016 with a return addressed, stamped envelope. Survey participants had the option to complete the survey online, but only five chose this option. Seventy-two surveys were completed and returned to the researchers for a response rate of 31%. No follow-up effort was made to reach nonrespondent survey recipients. While the response rate was relatively low, it was not greatly outside the response rates achieved by other published survey data focused on rangeland management or conservation programs.⁷ Additionally, the goal of this survey was to evaluate one relatively small program and not to generalize to a large population of ranchers in Nebraska. As such, the survey data provide insight into the

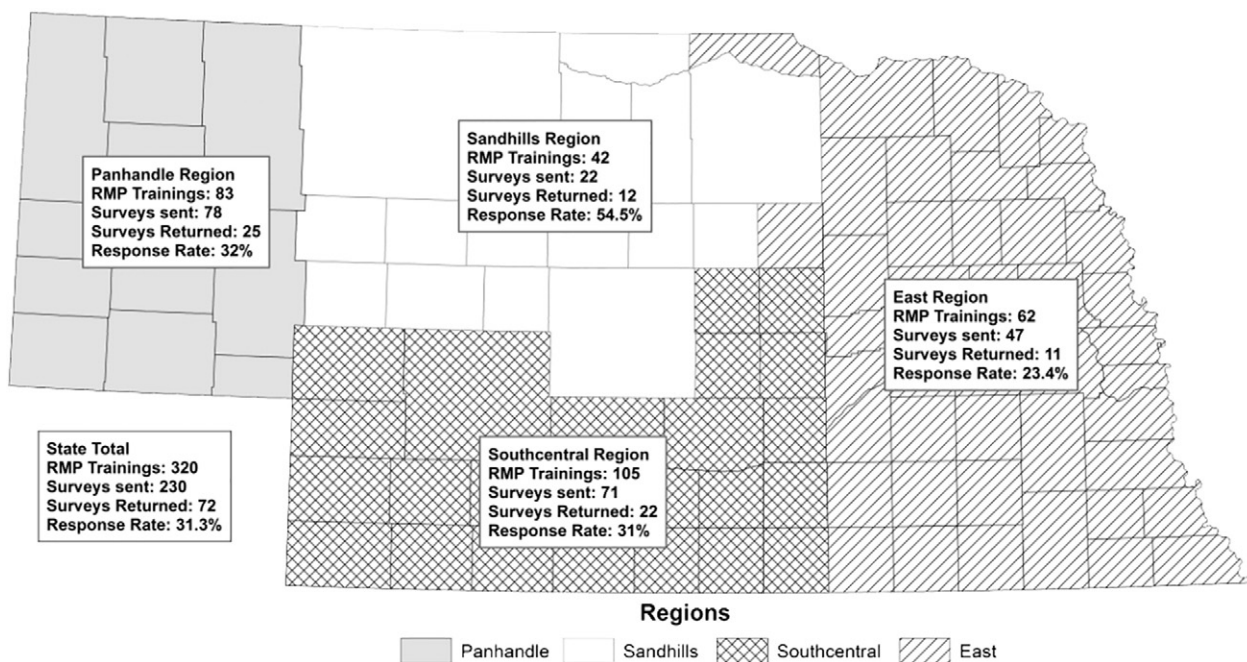


Figure 1. Number of participants, surveys sent, and survey response rate for the Nebraska Grazing Lands Coalition Rangeland Monitoring Program (RMP) from 2009 to 2014.

range monitoring program and the program's influence on Nebraska producers who participated in the survey. Some of the surveys had one or more of the questions left unanswered, but we included all returned surveys in our analyses and report the total number of respondents for each question.

The survey had three main segments: 1) producer grazing information, 2) evaluation of the RMP training, and 3) suggestions to improve the RMP and other Extension outreach. The producer grazing information segment included questions regarding the area within the state the producer was located, the size of their operation, and what type of grazing methods they employed to manage their livestock. The evaluation of the RMP segment asked questions about the value of the training, if the producer continued monitoring after the training, and if they changed their management because of the training. The final segment asked questions on the survey participant's views of the overall value of the RMP and provided opportunities for feedback from the survey participants on ways to improve the RMP.

Grazing Management of Survey Participants

Survey participants reported managing more than 200,000 acres of rangeland and providing care for more than 20,000 animals. These were predominately cow/calf pairs but also included replacement heifers and yearlings (Table 1). On average, survey participants in the Eastern region managed the fewest acres, and participants in the Panhandle managed

the greatest number of acres. Mean cattle herd sizes were greatest in the Sandhills and lowest in the Eastern region, and mean pasture sizes were greater in the Panhandle and lower in the Eastern region (Table 1).

Sixty-eight survey participants (94% of survey respondents; N = 72) indicated that they practiced some form of rotational grazing. Rest rotation was the most common rotational grazing practice reported, with over 50% of the survey participants indicating they managed their rotational grazing within a rest rotation (Fig. 2A). Rest rotation typically refers to grazing management that allows rangelands a full calendar year of grazing rest (SRM Glossary). However, rest is often referred to as any period of nongrazing on a particular pasture. It is unclear if respondents referred to rest rotations as total year or only partial growing season rest from grazing. Deferred rotation appeared to be more common in the Panhandle compared with other regions of the state, but overall deferred rotation and high intensity-short duration were each practiced by about 20% of the survey participants. Six percent of survey participants classified their grazing system as "other" and included responses of "patch grazing," "moved when pastures received 50% utilization," "seasonal rest," and "rotation dependent on condition and rainfall."

Length of pasture grazing time occurring on 50% or more of the survey participant's ranches in the Sandhills, South Central, and Eastern regions was 1 to 4 weeks (Fig. 2B). In contrast, 1 to 2 month grazing times on pastures were most common in the Panhandle, which is likely reflective of the

Table 1. Description of survey participants' livestock operations, including the size of the operations, number of cattle, and the average size of pastures on the ranch

	Panhandle	Sandhills	South Central	East	All Regions
Size of operation (acres)					
Number of responses	24	12	20	11	67
Mean	4,159	3,678	2,577	534	2,737
Max	18,000	10,240	18,000	2,000	18,000
Min	70	70	320	50	50
Total Acres	99,799	44,130	51,549	5,874	201,352
Cattle (n)					
Number of responses	24	11	21	9	65
Mean	322	388	315	173	300
Max	900	1,150	1,300	700	1,300
Min	3	30	35	27	3
Total	7,730	4,270	6,624	1,561	20,185
Average size of pastures (acres)					
Number of responses	20	10	21	10	61
Mean	327	245	222	70	216
Max	800	640	600	200	800
Min	5	15	65	5	5

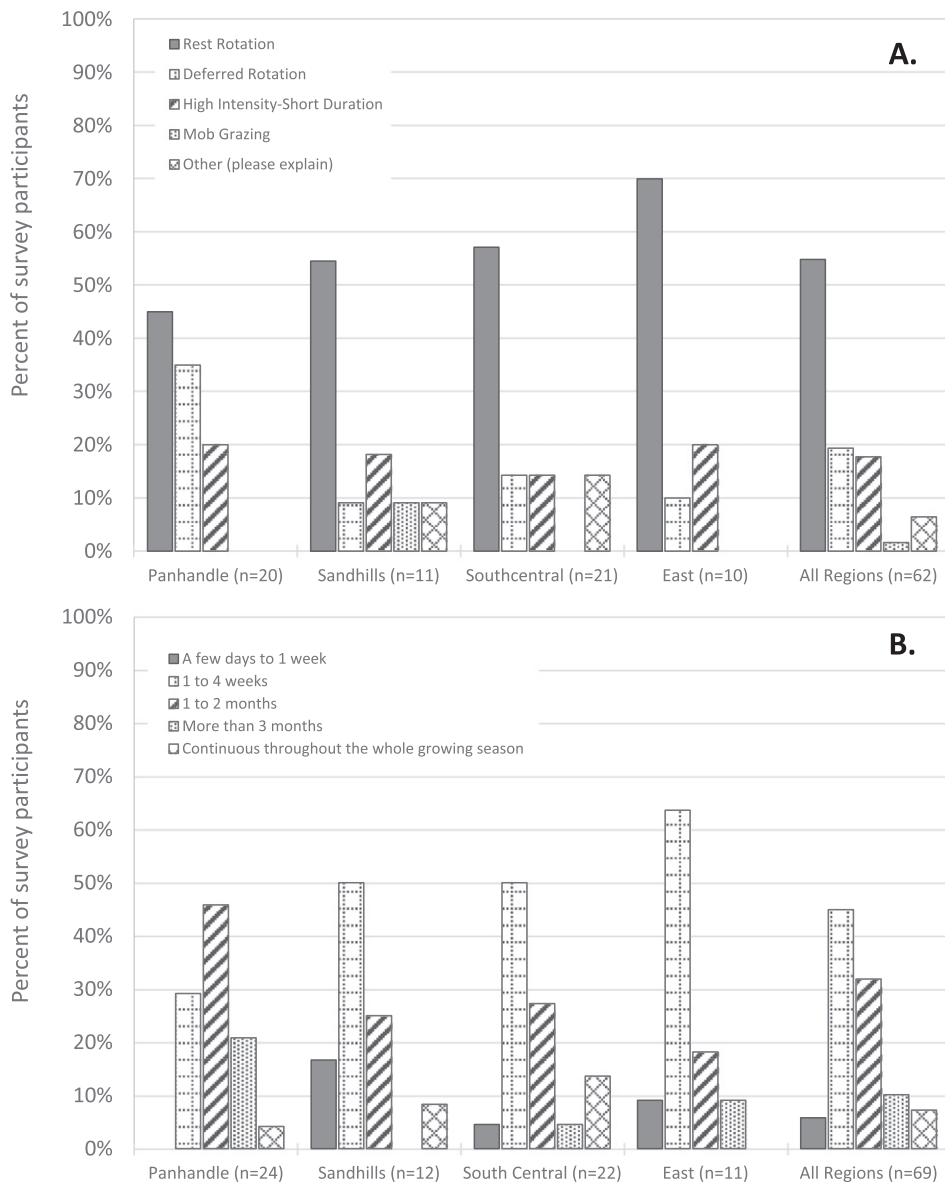


Figure 2. A. The type of rotational grazing strategy and **B.** the mean length of time cattle grazed on pastures during the growing season for survey participants in different regions of Nebraska.

drier climates and larger pasture sizes in the Panhandle compared with the other regions.

In the Panhandle, pastures were typically grazed only once during the growing season or once during the growing season and once after plant dormancy. Multiple grazing events during the growing season were more common in the other regions, especially in the East region. However, 40% of the total respondents reported only a single grazing event during the growing season as their primary grazing management on pastures (data not shown).

Evaluation of the Rangeland Monitoring Program

When asked why they participated in the RMP training, most respondents indicated that they wanted to 1) “gain a

greater understanding of rangeland management” and 2) “meet requirements for a NRCS conservation program” (see Table 2). Receiving training in monitoring methods was also a relatively important reason for participating in the RMP training. Seventy-six percent of survey participants indicated that the on-ranch meeting with a technician was very important when asked about the benefits of the RMP training (Table 2). This indicates that most of the RMP participants appreciated the face-to-face interaction and one-on-one training with the technician at their ranch. The monitoring tool kit and monitoring technique training also had high importance responses, 70% and 67%, respectively. The soil and vegetation quality analysis and technical support following the RMP training were rated relatively lower compared with other elements participants found helpful about the RMP (Table 2).

Table 2. Survey responses indicating reasons for producer participation in the RMP and the helpfulness of RMP elements

Question	Not important	Neutral	Very important	
Why did you participate in the Rangeland Monitoring Program?	%			n
To gain a greater understanding of rangeland management	6	19	74	62
To receive training in monitoring methods	5	30	66	61
To receive training on how to set up a monitoring program	12	40	48	60
To meet requirements for an NRCS conservation program	18	12	70	66
To receive technical grazing management support	18	40	42	60
How helpful were the following elements of the Rangeland Monitoring Program?				
On-the-ranch meeting with a technician	6	18	76	66
Monitoring technique training	4	28	67	67
Soil and vegetation quality analysis	12	38	50	66
Monitoring tool kit	6	24	70	67
Technical support following RMP training	17	46	37	65

Participants ranked the importance of the questions in the survey on a 1 to 6 scale. The scale was summarized with responses of 1 or 2 being Not Important, 3 or 4 being Neutral, and 5 or 6 being Very Important. NRCS indicates Natural Resource Conservation Service; RMP, Rangeland Monitoring Program.

Sixty-three of the survey participants (87.5%) indicated that they have continued with a monitoring program, and nine participants (12.5%) had discontinued monitoring following the RMP. Photo monitoring was the most common monitoring method that survey participants continued after the RMP. Eighty-seven percent of survey participants who

continued monitoring indicated they practiced this method (Fig. 3). A smaller percentage of the survey participants continued with clip and weigh herbage production estimates and line point intercept (46% and 23% of survey participants, respectively). Forty-seven percent of the survey participants reported using multiple monitoring methods. The most

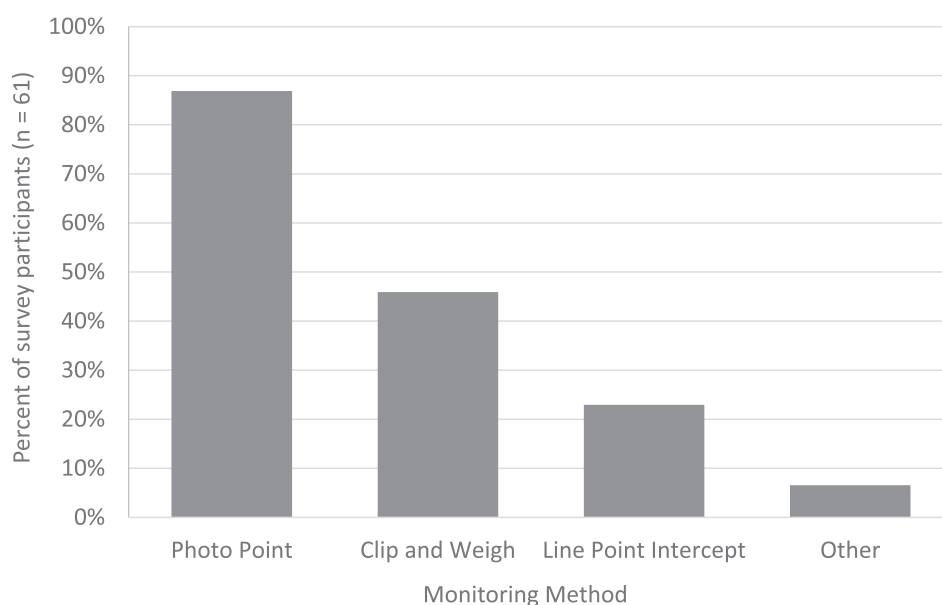


Figure 3. Monitoring methods practiced by survey participants who indicated they had continued monitoring following the Rangeland Monitoring Program (RMP) training. Other monitoring techniques included visual trend and stubble height measurement.

Table 3. Survey responses on why producers continued or discontinued rangeland monitoring following the RMP training

Question	Not important	Neutral	Very important	
How important are the following reasons in continuing your monitoring program?	%			N
Determine range condition and identify problem areas	3	25	71	59
Determine yearly forage production	7	41	53	59
Information to set annual stocking rates	3	37	60	60
Evaluate changes in management (e.g., change in grazing system)	4	37	60	57
Determine utilization levels on pastures	2	33	65	57
Evaluate long-term shifts in species composition	9	49	42	57
Fulfill a requirement for NRCS or other funding opportunity	15	15	71	62
Determine or evaluate leasing arrangements	40	39	21	57
How important were the following reasons for discontinuing your monitoring program?				
Time constraints	17	0	83	6
Monitoring data was not useful for management decisions	17	67	17	6
Tediousness of monitoring	0	83	17	6
Lack of confidence in correctly using monitoring techniques	17	33	50	6
Lack of confidence in plant identification	17	83	0	6

Participants ranked the importance of the questions in the survey on a 1 to 6 scale. The scale was summarized for simpler explanation of the survey with responses of 1 or 2 being Not Important, 3 or 4 being Neutral, and 5 or 6 being Very Important. NRCS indicates Natural Resource Conservation Service.

important reasons survey participants indicated for continuing monitoring were fulfilling a requirement for NRCS or other funding opportunities and determining range condition and identifying problem areas (Table 3). Time constraints were the most important reason monitoring was discontinued (Table 3).

Overall, survey participants gave the RMP favorable reviews. They typically responded that most of the training was very important in helping them develop an RMP on their ranches. When participants were asked about their willingness to recommend the RMP training to their neighbors, 70% (N = 69) said they were likely or very likely to recommend it. Greater than 71% of participants agreed or strongly agreed that the RMP training gave them a greater understanding of rangelands, more tools to help manage their rangelands, and a better understanding of monitoring techniques (Table 4). Additionally, 84% of survey participants indicated that the RMP gave them a greater ability to visually assess their pasture condition (Table 4).

Nearly 90% (N = 69) of the survey participants indicated that they made at least some changes to their management following the RMP, and more than 25% (N = 69) of the survey participants specified that they made several changes in management. When asked what specific changes they made

to their management, 40 survey participants gave written answers. The most commonly reported change in management was adjustments in the annual timing of grazing on pastures (Fig. 4). Other common changes in management included increased observations of rangelands, increased number of pastures, and increased pasture rotations.

The RMP and Monitoring Conducted by Survey Participants

The responses to the survey indicate that the RMP was an effective program to help livestock producers implement rangeland monitoring practices. Most survey respondents indicated that they have continued monitoring and that the RMP helped them better understand rangelands and adjust their grazing management practices. However, one unavoidable bias with the survey was that livestock producers who continue monitoring are typically more likely to return a survey than those who have discontinued monitoring practices following training.² This may have influenced our results in overestimating the proportion of RMP participants who have continued monitoring. Additionally, nearly 80% of our survey respondents were over the age of 50 years. While this follows trends in the mean age for principal agricultural operators in

Table 4. RMP survey participant responses to questions focused on the benefits of the RMP training

Question	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree	Number of responses
Participating in the RMP has..?	%					n
Given me a greater understanding of rangelands	0	3	26	31	40	68
Provided more tools to help manage rangelands	0	3	22	39	36	67
Given me a better understanding of vegetation dynamics	1	4	40	33	21	67
Given me a greater understanding of monitoring techniques	0	6	25	40	28	67
Led to greater ability in visually assessing my pastures	0	1	15	41	43	68

RMP indicates Rangeland Monitoring Program.

Nebraska,⁵ it may have underestimated younger rancher participation in the monitoring program. However, the responses from survey participants suggest that the RMP is accomplishing its overall goal of helping producers develop and implement rangeland monitoring practices and beneficial changes on their ranches.

Photo point monitoring was the most common method used by the survey participants. Photo points are a valuable qualitative method to document current conditions of a pasture, problem areas, or areas where active management is taking place to change landscape attributes. Photo points also are relatively fast to collect compared with most quantitative

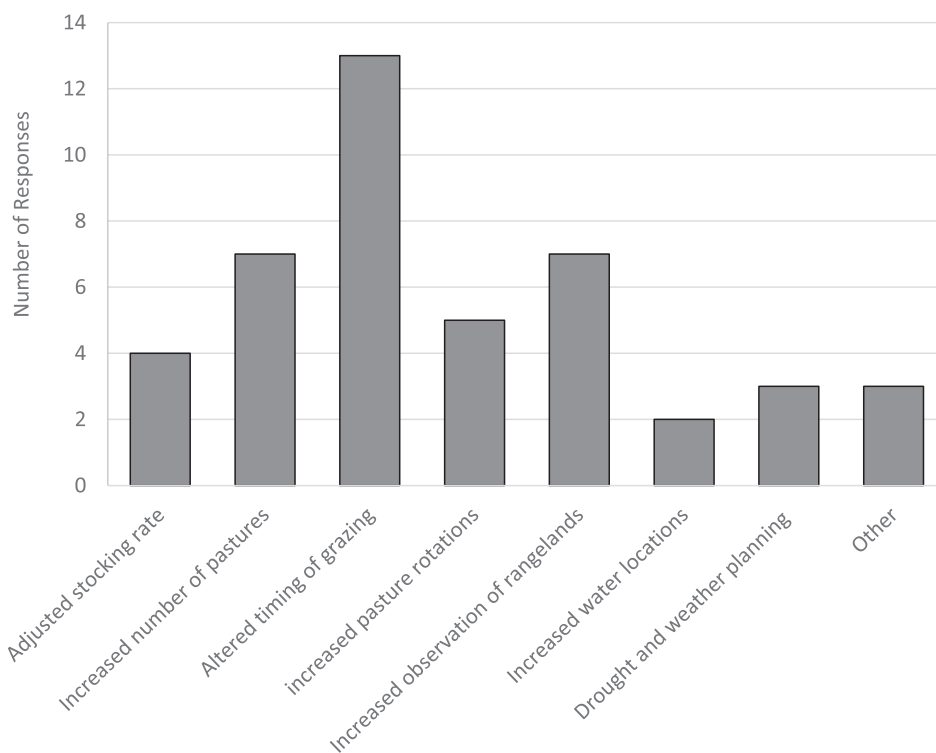


Figure 4. Management practices that survey participants indicated they made because of the rangeland monitoring program training. Forty survey participants (56%) provided written responses about their changes in management.

methods and require minimal skill to conduct. Nearly half of the survey participants indicated they collected more data than just photo points. This was likely because of the monitoring requirements within the incentive based conservation programs that many survey participants indicated was an important reason they continued monitoring. An interesting follow-up in the future will be to evaluate the number of survey participants who monitor their rangelands without incentives to continue monitoring.

On-Ranch Training and its Value in Improving Informal Monitoring

By providing funding to support individual training, the RMP allowed livestock producers the opportunity to learn in an environment that is familiar to them and ask questions directly to the technician. Research in other regions of the western United States has indicated that this type of training from university extension professionals was the most preferred method for a producer receiving information on rangeland monitoring.² Ranch-/rancher-specific training is an important component of successful outreach efforts in natural resource management and often responds to the needs of different ranching enterprises and diverse ecological contexts.^{8,9}

Many of the survey participants indicated that the RMP helped them better visually assess their rangelands. Training in formal, quantitative data collection techniques on their own rangelands likely helped ranchers better calibrate their senses for informal rangeland assessments conducted as producers work cattle, drive through pastures, or check water. This may have been the result of a better understanding of monitoring methods, more confidence in their estimates based off quantitative data collection, or a better sense of what they should be observing and evaluating. One survey participant indicated that “It does take time, but visual inspection can sure be improved by doing the clipping.” Woods and Ruyle¹⁰ indicated that informal rangeland monitoring through visual pasture assessments provided more spatial information at greater temporal resolutions compared to more formal monitoring techniques that are typically conducted at only a few key areas and visited only once per year. Informal monitoring is an important component of the decision-making processes for livestock producers and often drives long-term conservation planning. Suggestions given by the survey participants to improve the RMP included “more hands on workshops,” “more YouTube videos,” and “seminars with grass (pasture) photos and explanations.” These methods of information dissemination may provide opportunities for livestock producers to increase their abilities in visually quantifying rangeland productivity and condition by providing examples on which they can base their estimates.

Monitoring Within an Adaptive Management Feedback Loop

The high percentage of survey participants who said they continued monitoring, even using just photo-points, was

encouraging. However, monitoring implementation alone may not be an adequate end-goal of rangeland management outreach aimed at improving ranch and rangeland sustainability. The next step is leveraging ranchers’ interest in monitoring implementation into a better understanding of the links between management practices and ecological outcomes. While there are many reasons managers monitor, the theoretical core value of ecological monitoring in rangeland management is to inform adaptive management.^{11,12}

The large percentage of survey participants who indicated intent to change their management, and a smaller group who reported they already had, suggests that the RMP design effectively supports management change. Adjusting management to new information, or “closing the adaptive management loop,” requires data collection at meaningful temporal and spatial scales and adequate capacity to interpret and apply monitoring findings relative to management goals and objectives. Monitoring implemented to meet the requirements for enrollment in conservation programs may not lead to adjustments to management actions to serve either production or conservation goals unless data are easily summarized, displayed, and evaluated at management-relevant scales.¹³ Adequate support for ongoing data management, summary and interpretation, even of qualitative photo-point data, is greatly needed.¹⁴

Ranchers are time constrained, and private-lands managers likely experience the same trade-offs documented in a public lands ranching context between time and effort to collect monitoring data and time spent interpreting and applying formal and informal monitoring information to management.¹⁵ Thus, the ability of ranchers in Nebraska to adapt to complex weather, market, and ecological dynamics across scales will depend on the amount of monitoring data they collect, but also the rancher’s ability to synthesize that data into information to support appropriate management changes. Ranchers need the skills, social networks, and logistical support to interpret many forms of data, establish appropriate thresholds for management actions, and adjust management goals and objectives as they use monitoring data to provide links between their management actions and ecological outcomes. Many livestock producers who have persisted on rangelands have been able to develop these skills and incorporate their learned experience into their rangeland management.¹⁶ The NGLC provides a producer-led platform that helps support livestock producers in their efforts to incorporate monitoring into their management and offers a social network of other producers and technicians to contact for information. However, as indicated by some of the survey participants, including more opportunities for follow-up conversations, training, and information with the RMP may improve the ability of ranchers to close the adaptive management loop by better using monitoring data in their management decisions. Providing greater decision support tools, technical services, and science-based information is an important role of organizations like the NGLC, the NRCS, and university extension. These tools and programs should assist ranchers in incorporating the best available monitoring

data into applicable and sustainable conservation management practices with measurable and objective-driven outcomes.¹⁴

Conclusions

The goal of RMP was to assist livestock producers to better understand and document the influence of their management on their rangelands. The survey indicates that RMP participants valued the information they received through the program. They also appreciated the program's on-ranch approach to delivering rangeland monitoring outreach. The on-ranch training approach requires more time and expense to operate than hosting a one-time workshop, but it may provide a more preferred and effective way to train individuals in monitoring techniques. New technology, such as online chats, online videos, or real-time online demonstrations (e.g., Facebook live or live webcasts), may assist rangeland educators in reaching more livestock producers in a more personal and context-specific way without the added labor and cost requirements of an individual on-ranch visit.

Incentives to monitor were an important reason survey participants took part in the RMP and continued monitoring. However, many survey participants indicated that the RMP increased their understanding of rangelands, influenced their management, and gave them greater abilities to conduct informal monitoring through visual assessments of their rangelands. Providing opportunities to gather more information after the initial RMP training, greater assistance and tools in interpreting monitoring data, and follow-up by the RMP technicians may help in assisting livestock producers get the most out of their monitoring data.

Acknowledgements

The Nebraska Grazing Lands Coalition provided funding for the survey. We would like to acknowledge and thank the producers who participated in the RMP, returned surveys, and provided feedback on ways the program could be improved.

References

1. HOLECHEK, J.L., R.D. PIEPER, AND C.H. HERBEL. 2004. Range management: Principles and practices. 5th ed. Upper Saddle River, NJ: Prentice-Hall, Inc. 607 pp.
2. FERNANDEZ-GIMENEZ, M.E., G. RUYLE, AND S.J. McCLARAN. 2005. An evaluation of Arizona Cooperative Extension's rangeland monitoring program. *Rangeland Ecology & Management* 58:89-98.
3. RICHARDS, R.T., AND M.R. GEORGE. 1996. Evaluating changes in ranch management practices through extension education. *Journal of Range Management* 49:76-80.
4. COPPOCK, D.L., AND A.H. BIRKENFELD. 1999. Use of livestock and range management practices in Utah. *Journal of Range Management* 52:7-18.

5. NEBRASKA DEPARTMENT OF AGRICULTURE, 2017. Nebraska Agriculture Fact Card. Available at: <http://www.nda.nebraska.gov/facts.pdf>.
6. BUREAU OF LAND MANAGEMENT, 2014. Nebraska Surface and Mineral Status GIS shapefile. Available by request from the BLM Wyoming state office.
7. LUBELL, M.N., B.B. CUTTS, L.M. ROCHE, M. HAMILTON, J.D. DERNER, E. KACHERGIS, AND K.W. TATE. 2013. Conservtaion program participation and adaptive rangeland decision making. *Rangeland Ecology & Management* 66:609-620.
8. ROLFE, J.W., A.E. LARARD, B.H. ENGLISH, E.S. HEGARTY, T.B. McGRATH, N.R. GOBIUS, J. DE FAVERI, J.R. SRHOJ, M.J. DIGBY, AND R.J. MUSGROVE. 2016. Rangeland profitability in the northern Gulf region of Queensland: Understanding beef business complexity and the subsequent impact on land resource management and environmental outcomes. *The Rangeland Journal* 38:261-272.
9. MARSHALL, N.A., AND A. SMAJGL. 2013. Understanding variability in adaptive capacity on rangelands. *Rangeland Ecology & Management* 66:88-94.
10. WOODS, S.R., AND G.B. RUYLE. 2015. Informal rangeland monitoring and its importance to conservation in a U. S. ranching community. *Rangeland Ecology & Management* 68:390-401.
11. HOLLING, C.S., AND G.K. MEFFE. 1996. Command and control and the pathology of natural resource management. *Conservation Biology* 10:328-337.
12. ALLEN, C.R., G.S. CUMMING, A.S. GARMESTANI, P.D. TAYLOR, AND B.H. WALKER. 2011. Managing for resilience. *Wildlife Biology* 17:337-349.
13. LOVETT, G.M., D.A. BURNS, C.T. DRISCOLL, J.C. JENKINS, M.J. MITCHELL, L. RUSTAD, J.B. SHANLEY, G.E. LIKENS, AND R. HAEUBER. 2007. Who needs environmental monitoring? *Frontiers in Ecology and the Environment* 5:253-260.
14. BRISKE, D.D., B.T. BESTELMEYER, J.R. BROWN, M.W. BRUNSON, T.L. THUROW, AND J.A. TANAKA. 2017. Assessment of USDA-NRCS rangeland conservation programs: Recommendation for an evidence-based conservation platform. *Ecological Applications* 27:94-104.
15. SAYRE, N.F., E. BIBER, AND G. MARCHESI. 2013. Social and legal effects on monitoring and adaptive management: A case study of national forest grazing allotments, 1927-2007. *Society and Natural Resources* 26:86-94.
16. SAYRE, N.F., W. DEBUYS, B.T. BESTELMEYER, AND K.M. HAVSTAD. 2012. "The Range Problem" after a century of rangeland science: New research themes for altered landscapes. *Rangeland Ecology & Management* 65:545-552.

Authors are Range Specialist, University of Nebraska-Lincoln, Panhandle Research & Extension Center, Scottsbluff, NE 69361, USA, mstephenson@unl.edu (Stephenson); USDA Northern Plains Climate Hub Fellow, USDA Northern Plains Climate Hub, Fort Collins, CO 80526, USA (Wilmer); Nebraska Grazing Lands Coalition Coordinator, Nebraska Grazing Lands Coalition, Chadron, NE 69337, USA (Bolze); and Range Technician, University of Nebraska-Lincoln, Panhandle Research and Extension Center, Scottsbluff, NE 69361, USA (Schiltz).