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## NEVADA RANGE MANAGEMENT SCHOOL: FOCUS ON SUSTAINABILITY

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Since 2005, the University of Nevada Cooperative Extension has led a team of educators, combining science and common logic to teach a “Range Management School” (RMS) curriculum to agricultural producers and land managers across rural Nevada. Other teaching partners included the Nevada Department of Agriculture; Bureau of Land Management; U.S. Forest Service; Natural Resources Conservation Service; University of Nevada’s College of Agriculture, Biotechnology and Natural Resources; and the Nevada ranching industry. RMS workshops, focusing on sustainability, are designed to put ranchers and agency range conservationists on the same page, ensuring not only better forage available for livestock, but healthy, productive rangelands for wildlife, recreation and other uses. To date, 11 workshops have reached 241 participants in 10 rural Nevada communities.

## **Preparation and Partnerships**

The original curriculum for “Range Management School” (RMS) was developed by Colorado State University in partnership with federal land management agencies (LeValley et al 2000). Beginning in July 2004, University of Nevada Cooperative Extension (Extension) directed a diverse working group that met monthly for five months to organize and bring RMS training to Nevada. In October 2004, the Colorado RMS team, comprised of four instructors from Colorado State University Extension, NRCS, BLM and U.S. Forest Service, taught a diverse group of 27 Nevada range managers, scientists and ranchers at a “train the trainers” session. This workshop was sponsored by the Northeastern Nevada Stewardship Group, with funding from the Nevada Rangelands Commission and Grazing Lands Conservation Initiative (GLCI). Led by Extension, the Nevada working group continued to modify the curriculum to fit Nevada’s resources and needs.

Other partners in this educational effort included the Bureau of Land Management; U.S. Forest Service; Natural Resources Conservation Service; University of Nevada’s College of Agriculture, Biotechnology and Natural Resources; Nevada Department of Agriculture; and the Nevada ranching industry. Funding and promotional assistance through the years has been provided by the USDA Risk Management Agency, GLCI, Sustainable Agriculture Research & Education (SARE), Nevada Rangeland Resources Commission, Central Committee of Nevada State Grazing Boards and Nevada Cattlemen’s Association.

RMS uses sound science, collaboration and common sense within a unified message by a team of interdisciplinary instructors. The RMS curriculum, focusing on sustainability, is designed to put ranchers and agency range conservationists on the same page, ensuring not only better forage available for livestock, but healthy, productive rangelands for wildlife, recreation and other uses. This publication is based on a paper presented at the Fourth National Conference on Grazing Lands in Reno, Nevada, 2009 (McAdoo et al 2010).

## **Marketing**

During the first year, two mailings of 1,250 tri-fold flyers were sent to the UNCE-maintained agriculture producer mailing list. The first mailing was sent two months prior to the program, with the second occurring three weeks prior. Additionally, the month prior to the program 750 single sided flyers were mailed with the Nevada Cattlemen’s Association’s (NCA) *Sage Signals* publication. This mailing goes to all NCA members and associate members. A news release and half-page advertisement for each program was published in the prior month's issue of the *Progressive Rancher* and *Nevada Rancher* magazines. News releases were sent to each area newspaper two weeks prior to the program to be held in that area. Local county Extension offices were sent electronic and hard copies of flyers and news releases and were asked to help promote the program on a local level. During subsequent years, marketing was scaled back considerably, consisting primarily of magazine and newspaper articles, as well as e-mail contacts with the ranching and agency personnel in targeted communities.

## **Materials Produced**

An interdisciplinary team of instructors modified an existing curriculum (three-ring binder format) that was originally written by RMS instructors in Colorado. PowerPoint presentations were added/modified, as was supplementary material. The curriculum includes sections on the following: grass growth/physiology, principles of timing and duration of grazing, grazing plan strategies, riparian area management, grazing response index, animal nutrition, livestock behavior, targeted grazing, ranch management examples, monitoring by permittees and other information. The curriculum presents an uncomplicated approach to complex ecological concepts within a collaborative teaching effort by instructors from diverse backgrounds and agencies. The RMS curriculum is continually updated with teaching-team approval as new science-based information becomes available.

## Format and Audience

The RMS workshops were either one- or two-day events, depending primarily on the season of year (Table 1). Because of typical winter conditions, most winter workshops did not include a field day. The intent of the winter workshop was to allow ranchers time in the morning to feed cows. From 1 to 5 p.m., we discussed the plant-related portions of the workshop, followed by socializing during a good dinner. The livestock and ranch example portions were presented after dinner. Although spring workshops were difficult to time between calving and irrigation, they typically allowed the opportunity for a field trip, during which principles taught in the classroom could be demonstrated. Early fall workshops also allowed this option.



*Most Range Management School workshops included a field day to view examples of practices discussed in the classroom.*

In an effort to present this curriculum statewide, 11 workshops were held in 10 rural locations in northern and central Nevada between December 2005 and December 2008. Of the 241 workshop participants, 146 (60 percent) were agricultural producers, 69 (29 percent) were government agency personnel, and 26 (11 percent) were consultants, academics and other land users (Table 1). The RMS workshop sessions are still part of an active Extension program, but the workshops summarized for this special publication include only those conducted during the 2005 – 2008 period.

## Workshop Content

### *Plant Growth*

An understanding of plant growth, development and physiology is the cornerstone of the RMS program. This is a complex topic that involves many biological, physical, chemical and climatic interactions during each growing season. There are, however, a number of general concepts that are applicable to all grazing situations, and those concepts are our focus. One focal discussion details the complex interactions among plant growing points, environmental conditions and plant physiology as they impact plant growth. The relative resistance or susceptibility of various range plants to grazing is also discussed. We emphasize the annual growth cycle for grasses, including root growth and health, leaf re-growth and root/shoot balance. This module points out how these processes are affected by grazing, and to some degree, how grazing can be managed to minimize or prevent long-term adverse effects on overall plant health.

We devote two half-hour sessions to plant growth, sandwiched around a 15-minute break during which participants can look at plant specimens that have been prepared for viewing and handling.

### *Timing and Duration of Grazing*

After the plant growth module, we move into more detail about the importance of managing the timing of grazing (when grazing occurs), duration of grazing (over how much time grazing occurs) and the benefits this has for plant growth and recovery. By controlling the timing and duration of grazing, managers can control the following: (1) grazing frequency, i.e., the number of defoliations per unit of time; (2) grazing intensity, i.e., the proportional removal of plant material; and (3) opportunity for plant recovery, i.e., the chance for plants to grow and/or re-grow—the most important factor for plant health and productivity. To illustrate the results of managing timing and duration of grazing, we show several sets of “before and after” photographs. We focus on riparian areas because of their relatively quick response, ecological importance and multiple use values.

**Table 1. Summary of Nevada Range Management School workshops taught, 2005 – 2008.**

|                   |                 |   | Attendees           |                        |                    |                  |
|-------------------|-----------------|---|---------------------|------------------------|--------------------|------------------|
| Date              | Location        | Format                                    | Livestock Producers | Agency Representatives | Other <sup>1</sup> | Total            |
| 12/7/05           | Eureka          | 1-day afternoon/evening (included dinner) | 34                  | 10                     | 3                  | 47               |
| 4/11-12/06        | Fallon          | 2-day with field trip                     | 9                   | 1                      | 2                  | 12               |
| 4/25-26/06        | Winnemucca      | 2-day with field trip                     | 5                   | 6                      | -                  | 11               |
| 5/2-3/06          | Ely             | 2-day with field trip                     | 4                   | 11                     | 3                  | 18               |
| 5/8-9/06          | Elko            | 2-day with field trip                     | 30                  | 13                     | 4                  | 47               |
| 11/28/06          | Jackpot         | 1-day afternoon/evening (included dinner) | 8                   | -                      | -                  | 8                |
| 1/24/07           | Paradise Valley | 1-day afternoon/evening (included dinner) | 6                   | 6                      | -                  | 12               |
| 3/6-7/07          | Pioche          | 2-day with field trip                     | 12                  | 1                      | 1                  | 14               |
| 9/11-12/07        | Winnemucca      | 2-day with field trip                     | 16                  | 8                      | 2                  | 26               |
| 6/25-26/08        | Wells           | 2-day with field trip                     | 15                  | 4                      | 6                  | 25               |
| 12/16/08          | Tonopah         | 1-day afternoon/evening (included dinner) | 7                   | 9                      | 5                  | 21               |
| <b>Totals (%)</b> | -               | -   | <b>146 (60)</b>     | <b>69 (29)</b>         | <b>26 (11)</b>     | <b>241 (100)</b> |

<sup>1</sup> Includes consultants, academics, and other land users.

### ***Grazing Plan Strategies***

In a discussion about designing grazing strategies/management plans, we encourage participants to begin with things that can't be changed, determine what forages are best suited, match needs with supply and determine how to fill deficits. Plant growth needs and animal nutritional requirements are reviewed, and several grazing systems are presented. Management tools, including, fencing, herding, behavior modification, water developments, salt and supplement placement and vegetation manipulation are also discussed. Although each plan must be site-specific, the following guidelines provide a general grazing plan template: (1) provide as much growing season recovery time as possible; (2) consider plant growth rate when planning grazing duration by area; (3) if possible, increase the number of pastures and/or stock water sources for flexibility; (4) consider combining herds to make more pastures available; (5) avoid grazing the same unit at the same time year after year; (6) adjust grazing intensity to match season of use; (7) integrate the plan for effectiveness; (8) collaborate (i.e., rancher and land management agency working together) to design the plan if public land is involved; and (9) monitor and apply adaptive management.

### ***Considerations for Riparian Area Grazing***

There are many tools and strategies for improving riparian areas with livestock grazing management. No one approach works best everywhere. In general, riparian areas improve with a strategy that includes more of the good practices and less of the bad ones (the ones that commonly lead to trouble). In general, the following practices are typically most successful: early grazing, short duration grazing, cool season use, use of riparian pastures, rotating grazing year to year, light to moderate use intensity, even grazing use, long plant recovery periods, regrowth before winter, occasional rest from grazing, deferred grazing, many off-stream waters, scattered salt/supplement and cleaned pastures (no straggler livestock left behind). The discussion includes a description of what constitutes a properly functioning riparian area, focusing on the bank-protecting plants that would thrive under proper livestock management and the commensurate benefits of floodplain building, aquifer recharge, longer flow period, deeper pools,

wider riparian vegetation belt and narrower stream channel.



*Riparian areas respond positively to riparian grazing management practices described at Range Management School workshops.*

### ***Monitoring***

Rangeland monitoring is the orderly collection, analysis and interpretation of resource information (data) used to make both short- and long-term management decisions. This presentation emphasizes the importance of monitoring and the rationale for monitoring by objective, with an understanding that both short-term and long-term monitoring strategies may be needed. The discussion includes a segment on where to monitor, emphasizing key areas, key species and critical areas. The "how to" regarding monitoring is presented in overview fashion, outlining simple but dependable methods for both upland and riparian area monitoring. Good communication between permittees and agency specialists is required for a successful monitoring program. Examples of monitoring techniques are presented in the field during the two-day workshops.

### ***Animal Nutrition***

After spending three and a half hours discussing the plant-related portion of the curriculum, we turn to the subject of livestock, starting with a module on range animal nutrition. This presentation begins with a video on rumen and micro-flora interactions, followed by a discussion of nutrient proportioning that includes maintenance, activity, growth, milk production, body reserves (fat) and reproduction. Nutrition and management are the keys to range livestock production, with the most important

factors being time of calving, a shortened calving interval, use of moderate frame cows, strategic weaning, body condition score stockpiling, cattle distribution, mineral supplementation and disease/animal health management. A major emphasis is placed on the opportunity to stockpile body condition during the cow's second trimester of pregnancy.

### ***Livestock Behavior***

Turning to the topic of influencing or modifying livestock behavior, we make a presentation based on the BEHAVE (Behavioral Education for Human, Animal, Vegetation and Ecosystem) management program, a compilation of more than 20 years of work by Dr. Fred Provenza of Utah State University. Some primary emphasis points are: young animals learn quickly and remember for years; experience affects food intake; palatability is dynamic; nutrients increase palatability; variety enables animals to meet nutritional needs and avoid toxins; animals learn every day; and we (humans) can influence the learning process. This presentation illustrates how simple strategies can be used to improve the efficiency and profitability of livestock grazing. These strategies also improve the quality of life for the managers and their animals, as well as the long-term sustainability of natural resources on public and private lands.

### ***Grazing Response Index***

The grazing response index (GRI) is used to assess the effects of grazing during the growing season and assist with planning for the following growing season (Reed et al. 1999). It gives a numerical rating to each of the three following criteria: (1) frequency of defoliation during the growing season; (2) intensity of grazing (the amount of leaf material removed) during the grazing period; and (3) opportunity for vegetation growth or regrowth. Because of its relative importance, the latter is considered double the value of the other criteria. Several examples are given to illustrate the use of GRI. This index is easy to understand and communicate, incorporates timing and duration of grazing, reduces conflict and gives managers the opportunity to practice the art and science of adaptive rangeland management.

### ***Targeted Grazing***

During 2008, we added "targeted grazing" to the workshop agenda. Also called "prescribed grazing" and "managed herbivory," prescribed grazing is the application of a specific kind of livestock at a determined season, duration and intensity to accomplish defined vegetation or landscape goals. Most typically, the animals are used to graze, browse or trample undesirable vegetation. Targeted grazing is a powerful tool for vegetation management, with results seen over the long term, not usually the first year. Uses include weed control, revegetation (through hoof action to prepare seedbed and trampling to cover seeds), fuels management (by fuel load reduction and/or grazing green strips for maintenance), and wildlife habitat improvement, typically by altering plant species composition. Proper application of targeted grazing requires knowledge of plant tolerances to grazing, animal dietary preferences and needs, and proper timing.

### ***Ranch Management Examples***

This presentation consists of an overview of either the Gund Ranch (central Nevada) or the Cottonwood Ranch (northeastern Nevada), where the ranch managers have site-specifically incorporated principles taught in the Nevada RMS workshops to improve the productivity and sustainability of their particular operation. Agricultural producers and land management agency specialists appreciate seeing practical application of the concepts being taught.

## **Summary of RMS Workshop Impacts**

### ***Post-Workshop Evaluations***

Upon completion of each workshop, the participants were asked to evaluate the workshop. We received 148 evaluations (61.4 percent response rate) from the 241 participants at the 11 RMS workshops (Table 2). Based on a 5-point ascending scale (1 = successful, 5 = very successful), respondents rated understandability from 4.0 to 4.73, with an average rating of 4.41. Asked whether the workshop was worth attending, average responses by location ranged from 3.50 to 4.89, with an over-all average of 4.54. Respondents were likely to use the information taught, with averages by location ranging from 3.67 to 4.87, and an overall average rating of 4.48 (Table 2).

**Table 2. Summary of post-workshop surveys for 11 Nevada Range Management School workshops in rural Nevada communities, by location, from 2005–2008. Ratings are based on a 5.0 Likert scale (1 = unsuccessful, 5 = very successful).**

|  | Abbreviated Questions |                 |                        |                  |                           |                     |
|--|-----------------------|-----------------|------------------------|------------------|---------------------------|---------------------|
| Location (Date)                                  | Up to Date?           | Understandable? | Appropriately Diverse? | Worth Attending? | Will You Use Information? | Average by Location |
| <b>Eureka<sup>1</sup><br/>(12/7/05)</b>          | 4.58                  | 4.54            | 4.42                   | 4.33             | 4.54                      | <b>4.48</b>         |
| <b>Fallon<sup>2</sup><br/>(4/11-12/06)</b>       | 4.44                  | 4.33            | 4.56                   | 4.89             | 4.56                      | <b>4.56</b>         |
| <b>Winnemucca<sup>3</sup><br/>(4/25-26/06)</b>   | 4.75                  | 4.38            | 4.75                   | 4.75             | 4.38                      | <b>4.60</b>         |
| <b>Ely<sup>4</sup><br/>(5/2-3/06)</b>            | 4.44                  | 4.33            | 4.33                   | 4.11             | 3.88                      | <b>4.22</b>         |
| <b>Elko<sup>5</sup><br/>5/8-9/06)</b>            | 4.84                  | 4.47            | 4.71                   | 4.69             | 4.74                      | <b>4.69</b>         |
| <b>Jackpot<sup>6</sup><br/>(11/28/06)</b>        | 4.17                  | 4.00            | 4.00                   | 3.50             | 3.67                      | <b>3.86</b>         |
| <b>Paradise Valley<sup>7</sup><br/>(1/24/07)</b> | 4.55                  | 4.36            | 4.45                   | 4.64             | 4.82                      | <b>4.47</b>         |
| <b>Pioche<sup>8</sup><br/>(3/6-7/07)</b>         | 4.77                  | 4.43            | 4.43                   | 4.43             | 4.29                      | <b>4.44</b>         |
| <b>Winnemucca<sup>9</sup><br/>(9/11/07)</b>      | 4.60                  | 4.47            | 4.43                   | 4.93             | 4.87                      | <b>4.67</b>         |
| <b>Wells<sup>10</sup><br/>(6/25-26/08)</b>       | 4.80                  | 4.50            | 4.50                   | 4.90             | 4.80                      | <b>4.70</b>         |
| <b>Tonopah<sup>11</sup><br/>(12/16/08)</b>       | 4.73                  | 4.73            | 4.73                   | 4.82             | 4.73                      | <b>4.68</b>         |
| <b>Average by Question</b>                       | <b>4.61</b>           | <b>4.41</b>     | <b>4.48</b>            | <b>4.54</b>      | <b>4.48</b>               | <b>4.49</b>         |

<sup>1</sup> Attendance = 47, response = 24 (40%)

<sup>2</sup> Attendance = 12, response = 9 (75%)

<sup>3</sup> Attendance = 11, response = 8 (73%)

<sup>4</sup> Attendance = 18, response = 9 (50%)

<sup>5</sup> Attendance = 47, response = 32 (68%)

<sup>6</sup> Attendance = 8, response = 6 (75%)

<sup>7</sup> Attendance = 12, response = 11 (92%)

<sup>8</sup> Attendance = 14, response = 14 (100%)

<sup>9</sup> Attendance = 26, response = 14 (58%)

<sup>10</sup> Attendance = 25, response = 10 (40%)

<sup>11</sup> Attendance = 21, response = 11 (52%)

In response to the question, “What did you like best about this workshop?” the following are some selected comments from program participants:

#### **2005 - 2006**

- “It gave me more knowledge from rangeland to cow health”
- “Broad-based and thought-provoking”
- “Improving relationship potential between producers and public land managers”
- “Great overview of current range practices and sustainable grazing”
- “Before and after photo documentation”
- “I fully intend to go home and apply all or most of what I learned”

#### **2007**

- “Based on sound biological principles”
- “Incredible knowledge from career-long and experienced professionals imparted and received”
- “Appropriate to problems faced”
- “Emphasis on adaptive management and working together”
- “Provided easy to understand and attainable information”

#### **2008**

- “Opened my mind to new ideas”
- “The clarity of the presentations”
- “Interchange with scientists, agency folks, and producers”
- “Incorporated both agency and rancher standpoints”

#### ***Six-Month Post-Workshop Evaluation Surveys***

For a mid-term program evaluation six months after the 2006 and 2007 RMS workshops, we mailed follow-up surveys to participants, asking them to evaluate how useful the information received at the workshops had been to them, and how much they had incorporated into their operation/job. The results are discussed below by year:

**2006** - Approximately 71 percent of the respondents said that they have incorporated some or a great deal of the information they received in the workshop in their current operation/job. Overall, respondents indicated that the seminar increased their awareness of livestock grazing considerations

and left them more informed regarding grazing plan strategies, particularly in relation to animal nutrition and consideration of flexibility in timing and duration of grazing use. One participant who had traveled from Idaho to attend the workshop stated that he was “very impressed” with the program, while another respondent stated that “This was an excellent program—keep it going!”

**2007** - Fifty percent of the respondents said they have incorporated a great deal of the information they received in the workshop in their current operation/job. More specifically, 56 percent of the respondents reported that they “now use the production techniques” (rangeland monitoring, estrus synchronization, grazing plan strategies, etc.) presented in the RMS workshops. The respondents indicated that the seminar provided easy to understand, applicable information. They were impressed with the diversity and range of information presented.

#### ***Twelve-Month Post-Workshop Evaluation Survey***

A follow-up survey was sent to the 46 participants in the two 2008 RMS workshops, with 7 (15.2 percent) responding. The following bullet points summarize the survey results:

- The majority (57 percent) of respondents were producers, with 29 percent agency personnel
- 86 percent use range management techniques in their operation/job
- Based on a 7.0 ascending scale (1 = none, 7 = a great deal), the average response regarding incorporation of workshop information into operation/job was 4.29
- Based on a 7.0 ascending scale (1 = none, 7 = a great deal), the average response regarding whether range management was critical to today’s agricultural operations was 6.43
- 86 percent said they would attend a similar program if offered again.
- All (100 percent) of the respondents gained an improved understanding of range plant growth cycles as a result of attending the RMS workshops



- All (100 percent) of the respondents gained an improved understanding of grazing timing and duration considerations
- All (100 percent) of the respondents gained an improved understanding of the Grazing Response Index
- 57 percent of the respondents have created a grazing plan for their operation as a result of attending the RMS workshop
- 71 percent of the respondents have implemented rangeland monitoring techniques as a result of attending the RMS workshop
- In terms of nonfinancial benefits of workshop attendance, respondents listed: (1) “brought the opportunity for employees to be educated in the area of grazing;” (2) “increased consideration for sustainable grazing techniques;” (3) “supplemented what I knew and reinforced my plant skills...helped with my writing about rangelands.”

### Summary and Future Plans

The Nevada RMS program is making a difference. In a 2007 letter from Nevada’s Legislative Committee on Public Lands, Sen. Dean Rhoads (Chair) stated: “The Legislative Committee on Public Lands was very impressed with the interdisciplinary approach of the school [RMS] and its focus on sustainable range management for livestock, wildlife and recreation.” According to Carol Evans, riparian specialist for the Elko BLM District Office, “Range Management School is making a positive difference in the working relationships between the BLM and public land ranchers.” It is obvious that many participants in the Nevada RMS workshops are in the “early-adopter phase” of applying concepts learned. Extension is continuing to lead RMS workshops in Nevada. During 2010, a half-day workshop, with 20 attending, was held in Battle Mountain. The RMS interdisciplinary instruction team is currently updating the curriculum and planning additional

workshops in response to requests. We are also contemplating new delivery approaches and considering the possibility of offering an advanced RMS workshop.



*Principles taught during Range Management School ensure not only better forage for livestock, but healthy, productive rangelands for wildlife, recreation, and other uses*

### References

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