INTEGRATING STOCKMANSHIP INTO RANGELAND MANAGEMENT

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NEED FOR STOCKMANSHIP IN RANGELAND MANAGEMENT

Distribution is Critical

Cattle and other livestock are selective foragers; consequently they do not use pastures uniformly. Locations that cattle typically graze are constrained by physical and topographical features within a pasture (Senft et al. 1987). Cattle avoid traveling long distances from water (Valentine 1947). Many land managers expect cattle to graze significantly less in areas 1 to 2 miles from water, and they feel that areas greater than 2 miles from water are unusable (Holechek 1988). Cattle also tend to avoid grazing steep slopes (Mueggler 1965). Most cattle utilize slopes up to 10% without any problems, but grazing drops by over half on slopes over 30% (Holechek 1988). Similarly, cattle avoid high elevations, and livestock's response to vertical distance from water is more sensitive than horizontal distance from water (Roath and Krueger 1982; Bailey 2005). Consequently, it is difficult to get cattle to properly utilize extensive pastures with limited water sources or rough and rugged terrain. In our experience, about one third of extensive arid and semi-arid pastures or foothill or mountainous pastures receive little or no grazing.

Within physical and topographical constraints, cattle and other large herbivores seek out areas that contain high quality forage (Bailey et al. 1996). They are attracted to areas that contain forages with high levels of crude protein and low levels of fiber (e.g., low acid and neutral detergent fiber). When forages first turn green and are growing actively, forage quality is generally favorable throughout the pasture, and grazing distribution is often not a major issue except in exceptionally rugged terrain or in areas very far from water. Similarly, forage quality is relatively uniform throughout the pasture in the fall and winter after plants become dormant. Consequently, grazing distribution is determined primarily by physical and topographical constraints during these periods (Bailey 2005). In contrast, forage quality can be heterogeneous during the summer when forages on uplands become dormant and drop in quality, and vegetation near streams (termed "riparian areas") remains green and high quality. If forage quality is heterogeneous, cattle concentrate in areas with high-quality green forage and avoid areas with dormant, low-quality forage. In addition to high quality forage, riparian areas also contain water for drinking and shade. Correspondingly, it is not surprising that cattle prefer riparian areas, especially during mid-summer to early fall (Bailey 2004).

We conducted a study that demonstrated the effect of forage quality on distribution (Bailey 1995). We created one heterogeneous pasture with three sections: 1) previously grazed with high forage quality but low forage quantity; 2) ungrazed and fertilized with nitrogen resulting in high forage quality and high forage quantity; and, 3) ungrazed and unfertilized resulting in low to moderate forage quality and high forage quantity. Steers were allowed free access to choose among the three sections of the pasture. As expected, steers spent the most time (~ 59%) in the fertilized areas with the high forage quality and forage quantity (section 2), but steers also spent considerable time (~ 39%) in the previously grazed area (section1). Steers avoided (~ 1% of their time) section 3 with high forage quantity and low forage quality. They went to that section once and then did not enter it again for 21 consecutive days. In contrast, steers spent about the same amount time in each of three sections of a homogeneous pasture where forage quantity and quality were similar. We learned that grazing distribution is often more uniform during the first part of the growing season when grass is green throughout the pasture or during the fall and winter after forage has become dormant. When forage quality is heterogeneous, cattle select areas with forages containing greater concentrations of nutrients.

Consequences of Uneven Grazing Distribution

Forage utilization in areas where cattle concentrate tends to become excessive, while much more grazing could be sustained in areas that cattle tend to avoid (e.g., steep slopes and areas far from water). Repeated heavy grazing results in reduced plant vigor, poor plant reproduction, and soil disturbance (Holechek et al. 1999). Over time, heavy grazing results in decreased forage productivity, increased soil erosion, and wildlife habitat degradation. In severe situations, stocking rates must be reduced because of the decline in forage productivity. In riparian areas where cattle often prefer to graze, concentrated use changes stream channel structure resulting in wider and shallower streams and corresponding decreases in streambank stability, water quality and fisheries habitat (Kauffman and Krueger 1984).

On public lands, land managers set stocking rates and establish standards to prevent overgrazing and minimize adverse impacts on rangeland health. Public land managers, for the most part, have set stocking rates so that there is sufficient forage for the livestock. However, resource damage may continue because of uneven grazing distribution. Riparian areas have many resource values and are the key to management of many public land allotments. If the forage stubble heights drop to 4 or 5 inches in riparian zones, cattle must be moved to a new pasture or off the allotment if no additional pastures are available (Tanaka et al. 2007). In such situations, public land managers require ranchers to move their cattle even if upland forage is relatively ungrazed and the scheduled grazing period in the permit (or lease) has not be reached. Consequently, grazing distribution is extremely important to ranchers with public land allotments. If cattle must be moved early, there may not be sufficient forage available on the rancher's private lands. In such situations, ranchers should consider alternative management practices to help ensure that cattle do not concentrate use in riparian areas (or other habitats) and utilize pastures relatively evenly (Tanaka et al. 2007).

Management Tools to Improve Cattle Distribution

Most of the tools to improve livestock grazing distribution have been known for almost 60 years (Williams 1954). However, development of global position system (GPS) and geographic information system (GIS) technologies have allowed scientists to better understand the underlying animal behavior associated with these practices and document the effectiveness of distribution management tools. Water developments reduce the distance cattle must travel from water and are clearly effective in improving uniformity of grazing, but they require substantial capital investment and continual maintenance. Fencing can be used to constrain where cattle can move, but it has little impact on their choice of where to graze within the enclosure (Bailey and Brown 2011). Strategic placement of salt and supplement can serve as attractants and be used to encourage grazing near placement sites. Salt is most effective when the forage is lush and moisture levels in grasses are relatively high. Protein supplements are most effective when forage is dormant and nutrients levels are relatively low (Bailey 2004). Protein supplements are usually more effective for attracting cattle than salt (Bailey et al. 2008).

Low-stress herding can be used to reduce the time cattle spend in riparian areas. In a study conducted in central Montana (Bailey et al. 2008), we found that herding reduced the time cattle spent within 100 yards of streams by about 3 hours per day. Correspondingly, stubble heights in riparian areas where cattle were herded were about 3 inches higher than in areas where cattle were allowed to roam freely. The difference between the treatments was sufficient to have clear management implications. If this study had been conducted on public lands, cows that were herded could have remained in the pasture much

longer than the free-ranging cows.

The combination of herding and strategic supplement placement can be used to focus cattle grazing on uplands. In one treatment of the central Montana study, cattle were herded 0.6 to 1.2 miles from streams to an upland site containing low-moisture block (LMB) protein supplement and salt. In a second treatment, cattle were herded to a site with salt, but no LMB. Forage utilization within 600 yards of the LMB and salt placement site was about twice as high as the corresponding location where cattle were herded to salt alone. In a study in central New Mexico, cattle were herded 1 to 2 miles from water to 50-acre target sites containing LMB and salt (Pollak 2007). Cows spent 4 hours more per day in target areas than in corresponding control areas without any supplement. In a recent study in Arizona (Bruegger 2012), cows were herded 1 to 2 miles from water to sites in rugged terrain containing LMB. Cows spent about 34% of their time within 100 yards of LMB compared to less than 1% of their time during the control period when cows were not herded. Ongoing research conducted by the authors in southern New Mexico show similar results. Cattle grazing can be focused in areas they normally avoid through the use of low-stress herding and strategic supplement placement (Figure 1).

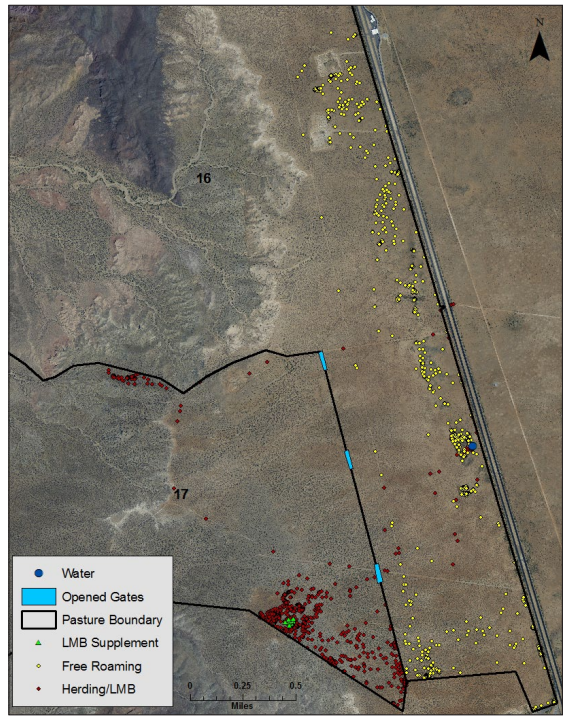

Figure 1. *Differences in grazing locations of cow 3086 during a 10-day period free roaming (yellow dots) and a 10-day period of herding every other day to low-moisture block (LMB) protein supplement (red dots) during the late fall in 2011 at the Chihuahuan Desert Range Research Center near Las Cruces, NM. Cow 3086 grazed with forty-three other cows and had access to pastures 16 and 17 through opened gates during both 10-day grazing periods.*

Other Benefits of Targeting Cattle Grazing

Targeting cattle grazing with the use of low-stress herding and LMB to areas that generally receive little utilization may have greater benefits than just improving distribution of livestock. Targeted grazing can be used as a tool to improve vegetation for wildlife habitat and decrease the risk of catastrophic wildfires. Targeted livestock grazing has the potential to improve wildlife habitat by altering vegetation composition, increasing productivity of certain species, and improving nutritive quality of forage (Vavra 2005). In west central Montana, researchers reported improved spring and summer forage for elk and deer habitat when targeted grazing treatments where applied during the fall of the previous year to remove standing dead and decedent plant material (Short and Knight 2003). In a central New Mexico study (Pollak 2007), pronghorn were attracted to sites that we treated with targeted cattle grazing using low-stress herding and LMB placement. Based on fecal pellet counts, pronghorn use of target areas almost tripled after targeted grazing. Additionally, targeted grazing on uplands that reduces overgrazing on ecologically sensitive, riparian areas can improve the habitat of several wildlife and fish species that rely on these areas. In addition to improving wildlife habitat, targeted grazing can

be an effective tool to decrease standing herbaceous biomass (i.e., fine fuels) in areas that have a high risk of catastrophic wildfires. In a computer simulation study looking at fire characteristics in the southwest United States, Varelas (2012) determined that the reduction in fine fuels from targeting cattle grazing in small areas of large pastures (10 to 20 acres) using low-stress herding and LMB could decrease flame length and reduce the extent of the wildfires in that area. The cost of targeted grazing in this scenario was competitive with other approaches for fine fuels management such as mowing or prescribed fire (Varelas 2012). Other research also has shown that livestock grazing can be used as a tool to decrease accumulated biomass and potentially reduce the severity of catastrophic wildfires on rangelands in western United States (Nader 2007; Diamond et al. 2009). It is difficult to calculate the economic value of benefits associated with targeted grazing, but when cattle distribution is managed for specific goals there are many ecosystem services that can be provided.

KEYS TO MAKING LOW-STRESS HERDING MORE EFFECTIVE

Most discussions of stockmanship and low-stress livestock handling are focused on normal husbandry operations, such as gathering pastures and working and sorting cattle in corrals. Use of stockmanship for rangeland management differs somewhat from livestock husbandry applications. Cote (2004) provides an in-depth and valuable discussion on the use of stockmanship for managing rangelands. We contribute our tips and experiences of using stockmanship in rangeland management in this article based on conducting research related to the topic over the last 10 years.

Timing of Herding

Herding, gathering and moving cattle in the western US is traditionally an early morning activity. In most cases, cowboys and ranchers aim to be moving cattle before or at sunrise. Their logical rationale is to maximize the time available for the cattle to travel to the desired endpoint and, usually more critical, ensure there is sufficient time to conduct the husbandry practice. For example, it is important to start gathering livestock as early as possible during branding to ensure all the cattle can be branded before dark. Another logical rationale for starting to herd at daybreak is to allow the cattle to move early in the morning while temperatures are cool. Although this approach is clearly logical and important for most livestock husbandry practices and movements of cattle from one pasture to another, it does <u>not</u> apply to targeting cattle grazing within a pasture.

To modify where cattle graze using low-stress herding, we should consider the animal's diurnal behavior patterns. Cattle generally have two major grazing periods, early morning (e.g., sunrise to 9 or 10 am) and evening (e.g., 5 or 6 pm until completely dark). During the summer, cattle typically go to water during the late morning and leave in late afternoon. If the water location is a stream, the cattle will spend around 5 to 7 hours in riparian areas. To minimize cattle impacts in riparian areas, we need to reduce the time they spend there. The goal is to allow cattle to drink all the water they want and then to move them to uplands rather than allow them to graze and loaf near the stream all afternoon. We recommend giving cattle 1 to 1.5 hours at the stream before herding them to uplands. Observe when cattle go to water and then begin herding 1 to 1.5 hours after most of the cattle arrive at the stream. In our central Montana study (Bailey et al. 2008), this recommendation resulted in us beginning to herd about noon (12 pm).

Herding cattle during early afternoon is against tradition in the western US ranching culture. You are asking cows to walk and climb slopes during the heat of the day. Cattle are often lying, ruminating and resting during this period. Correspondingly, it requires more effort from the stockman to move the cattle during mid-day than early morning. However,

implementation of the low-stress livestock handling skills developed by Bud Williams and described in the first issue of this journal (Hibbard 2012) make moving cattle during mid-day a reasonable and safe practice.

If herders begin at sunrise (congruent with tradition and contrary to our recommendation), the majority of cows will be grazing uplands rather than riparian areas. In our central Montana study (Bailey et al. 2008), about 40% of the cows were grazing in riparian areas during the early morning period. The need for herding is during the middle of the day when cattle are at water. Without management, the overwhelming majority of cows are in riparian areas at mid-day. If cattle are herded during the early morning they will begin to get thirsty about the time herding ends. Correspondingly, cattle would return to the stream about the same time they normally would and spend only a minimal amount of time in the target area.

In free-roaming conditions, cattle likely decide where to graze when they leave water (Bailey 2005), usually during late afternoon. After leaving water, cattle travel to an area and usually graze in that specific area until they return to water the next day. In a GPS tracking study, Bailey et al. (2004) found that well over half of tracking data of an individual cow were concentrated within a 30-acre area during the period from leaving water to returning to water (evening to late morning). Correspondingly, we believe the best time to direct where a cow grazes is during the time she normally makes that decision, specifically, when she leaves water. If riparian area management is not an issue and the objective is to focus cattle grazing on uplands, we recommend beginning herding during mid-afternoon. For example, in our Arizona and New Mexico studies that focused cattle grazing on uplands during the winter, we began herding between 2 and 3 pm which allowed us sufficient time to move the cattle to the target area before it began to get dark about 5 pm (Figure 2).

Figure 2. Cattle being herded by co-author, Mitch Stephenson, at mid-day in December 2011, using low-stress herding to a targeted area with low-moisture block protein supplement at the New Mexico State University's Chihuahuan Desert Range Research Center near Las Cruces, NM. (Photo by Jay Rodman)

Place Supplements at Target Area

Strategic placement of supplements, such as LMB and salt, makes herding to and settling cows in target areas both easier and more effective. In our research, we have placed LMB and salt in the center of our target areas. We herded cows from streams and developed water to the supplement sites. We worked hard to settle the cows near the supplement using the techniques described by Bud Williams in Hibbard (2012), especially the first time we moved them to the target area. After one or two trips to the supplement placement sites, cattle picked up their pace when they were within 100 to 200 yards of the LMB, often trotting to the supplement. After reaching the supplement, calves began to nurse or lie down. Movement of the herd naturally stopped. Based on our on-site observations, we believe that herding cattle to LMB makes herding easier and dramatically reduces the time to settle the cattle (Figure 3).

Unlike Bud Williams, we have not been successful in getting cattle to voluntarily return to and consistently graze previously underutilized areas after herding them there once and getting them settled. In many cases, cattle have remained in an area where we placed them for 12 to 48 hours. After they returned to water, however, cattle had little fidelity to the original placement sight unless we placed supplement there. It is likely that we did not have the skill to successfully place cattle once and have them consistently return to that area. However, we have been very successful in focusing cattle in target areas through use of periodic herding using low-stress handling techniques developed by Bud Williams (Hibbard 2012) and strategic placement of LMB and salt.

The time cattle have spent in target areas has been directly related to their consumption

Figure 3. *Cattle being settled at low-moisture block protein supplement within a targeted grazing area after being herded 1.5 miles at mid-day in December 2011 at the New Mexico State University's Chihuahuan Desert Range Research Center near Las Cruces, NM.*

Figure 5. *Placement of low moisture block and salt at the target area located at the Bair Ranch near White Sulphur Springs, MT. Cattle were herded in early August from a stream and the associated riparian area to the supplement, which is located in the center of the target area. Supplements are placed at least 30 yards part, but placed sufficiently close to allow the cow-calf pairs to remain in sight of.*

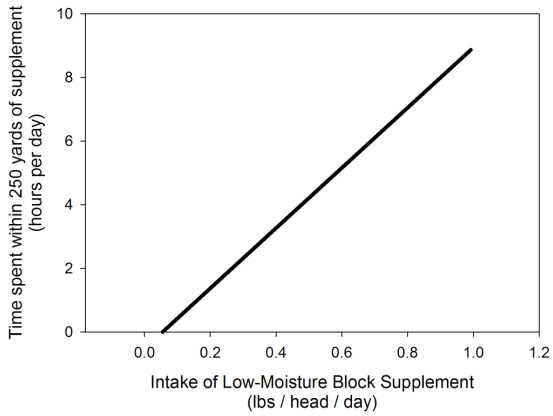

Figure 4. *Relationship of the time cattle spend at target areas and the intake of low-moisture block (LMB) supplement. Time at target areas is expressed as the hours per day GPS collared cows spent within 250 yards of supplement. This relationship is based on results of 5 trials located in New Mexico and Arizona. Crude protein content of LMB varied from 20 to 30%.*

of LMB supplement (Figure 4). If consumption of LMB was 1 lbs. per day, cows spent about 9 hours per day within 250 yards of the supplement. Cattle only spent about 0.5 hours within 250 yards of supplement if intake was only 0.1 lbs per day. When forage quality is low (e.g., winter), putting a protein supplement, such as LMB or liquid supplements, in the target area will increase the likelihood of cattle remaining nearby after placement. Protein supplements serve as an attractant to cattle when forage quality is low (Bailey et al. 2001). During periods when forage quality in a pasture is high, it is unlikely that placement of protein supplement will help focus cattle use in target areas. Cattle are not attracted to protein supplements when the grass is green and growing. Salt also is an attractant to cattle, especially when the grass is lush and growing. However, salt and mineral mixes are not nearly as persuasive as protein supplements for altering cattle grazing patterns (Bailey and Welling 2007; Bailey et al. 2008).

We recommend placing both salt and LMB blocks in the center of target areas. The LMB do not contain salt. So, to maximize the opportunity to attract cattle to the target area we suggest placing both LMB and white salt blocks. For LMB, the manufacturer typically recommends one block for every 20 to 25 cows to provide sufficient surface area for the cows in the herd to consume the desired intake. We have used their recommendation in our research, and it has been effective. We recommend placing blocks at least 20 to 30 yards from each other to ensure that a dominant cow can only defend one block and will not keep other cows from consuming other blocks. Try to keep the supplement in one general area so that the cattle herd can remain together when consuming supplement and loafing nearby (Figure 5). Keeping the herd together also may help "settle" the cows which

could facilitate them staying longer. When the supplement is consumed in one target area, place additional supplement in a new location that you would like to target. Selecting a new location will minimize cattle trampling damage immediately next to the supplement. If you are attempting to increase grazing use in the target area, place new supplement in a nearby location. If you are attempting to maximize uniformity of grazing, place new supplement in another part of the pasture that has received little use. It also is important to ensure that cattle are familiar with the supplements before using them as an attractant. We feed our cattle supplements in small pastures or at water for a short time before placing them in target areas (upland slopes or areas far from water) to accustom cattle to the supplements. Do not place any LMB (or other protein sources) and salt at water when you are using supplements as attractants.

Use Experienced Animals

Bud Williams emphasizes that you must prepare animals to take pressure and teach them that you can guide their direction of movement (Hibbard 2012). Our experience and research totally supports Bud's teachings. We worked hard the first time we herded a set of cattle out of a riparian area. Unlike moving from one pasture to another during the early morning, cattle are often loafing and in the shade to escape the heat when you begin herding cattle away from streams at mid-day. Cattle are usually scattered along the stream and must be gathered into one group before moving them to the upland target area. Cattle can be trained to respond to pressure and trained to be directed when you are getting them into one group (see Cote 2004). In our central Montana study (Bailey et al. 2008), getting the initial movement of the herd was much more difficult in riparian areas than starting movement in pastures containing only uplands (e.g., Pollak 2007). Once the cattle were moving, however, we rarely had any difficulties moving animals the remaining distance to the target area.

In our Montana riparian study (Bailey et al. 2008), every time we moved the cattle away from the stream and to the target area it got easier. In addition, the number of cattle that we had to move away from the stream decreased over time. We looked for cattle along the steam every day, but over the course of the study we only found cattle on the stream about 60% of the time. When we found cattle along the stream, about 75% of the herd was near the stream in the associated riparian area. Apparently, cattle began to expect that we would begin herding at mid-day. Near the end of the study, cattle would often travel to water at the normal time, drink, and then leave the stream and spend the afternoon on uplands. Similarly, Butler (2000) found in an anecdotal study conducted in Idaho that consistent herding was very effective in keeping cattle off of riparian areas. Only 4% of the herd would be found along streams the day following herding. If herding stopped for 1 or 2 days, around 20% of the herd returned to the stream.

The use of experienced animals also helps when targeting grazing on upland areas, and the time required to herd animals to target areas decreases over time. In contrast to our recommendation of herding cattle from riparian areas on a daily basis, we usually herd cattle to upland target areas every other day. Pollak (2007) compared daily versus weekly herding and, not surprisingly, found that daily herding was more effective in focusing cattle use of target areas. Herding cattle to upland target areas every other day appears to be a good compromise between reductions in labor cost and efficacy of focusing cattle use.

Other Suggestions

All the techniques taught by Bud Williams and presented by Hibbard (2012) are important, but we would like to emphasize some of the techniques that we used daily and feel are critical. First, training the animal to respond to pressure and take direction is a vital first step.

A natural human tendency is to forget this first step and start the animals on their way immediately. However, this step is needed at least to some degree even with experienced cattle. Working with the cattle to take pressure and direction will initially require additional time, but will save you time in the long run. Second, most people hate to implement "zig-zagging" when moving cattle on rangelands. Instead, they like to ride straight behind or along the side of the herd. Zig-zagging is essential to initiate movement when leaving a riparian area. It also is sometimes essential to get cattle to climb steep slopes. We have taken cattle through some very rugged terrain in the heat of the day by using the zig-zag technique (Figure 6). We typically direct the herd from the back of the herd using the "T" (i.e., zig-zagging in a 90 degree pattern to your desired direction or target).

In our research, we always had at least 2 riders when herding for safety. One rider would usually have been sufficient, but the areas that we worked were remote. We wanted to make sure someone was available in case of an accident. The "T" works great for any changes in direction required to keep the herd on the trail to the target area.

A good supply of horses is needed to conduct a long-term herding project. It can be surprising how many horses are needed to herd daily or every other day for a month or more. Invariably, horses you planned on using will go lame or require shoeing. Horses that have had several days of rest make herding easier, especially herding cattle out of riparian areas during the summer.

For riparian area management, herding makes the most sense during mid- to late summer when other distribution practices are likely not persuasive enough to keep cattle from congregating and potentially damaging stream banks and associated vegetation. The differential in forage quality between upland and riparian vegetation is greatest during mid to late summer in most areas of the western US. Consequently, DelCurto (2005) recommend

Figure 6. *Co-author, Derek Bailey, using the "zig-zag" technique to start cattle moving in late August 2006 at the New Mexico State University Chihuahuan Desert Rangeland Research Center located near Las Cruces. (Photo by Rob McNeely)*

avoiding grazing pastures with riparian areas during the "hot season" (July through mid-September). In many cases, ranchers have no choice but to graze pastures with sensitive streams and riparian areas during the "hot season". If fencing off the stream is not an option, herding should be considered strongly as the practice to resolve "hot season" livestock grazing issues on public land riparian areas.

Conclusion

Many ranchers that we have visited with do not consider herding a viable alternative to solve riparian area issues or to target cattle grazing for fine fuels control and/or wildlife habitat improvement. Clearly, herding is a labor-intensive activity. Tanaka et al. (2007) conducted a case study based on ranches in northeastern Oregon and found that herding cattle out of riparian areas resulted in projected net loss of about $2000 per year. However, this is just a projection and would clearly differ among ranches, economic conditions and skill level of the herders. Butler (2000) reported that intensive herding was a significant economic benefit to the grazing association in their Idaho study. Similarly, Cote (2004) describes several success stories of placing cattle in "undesirable" areas in large public land grazing allotments that, when done properly, significantly reduced labor requirements and extended allotment grazing times while meeting or exceeding agency stubble height requirements. Some ranchers, however, have said that it is simply too much trouble to herd cattle more often than absolutely needed. Others have claimed that cattle "beat them back to the creek" when they herded them out of riparian areas. Herding cattle out of riparian areas during mid to late summer is probably one of the most challenging tasks of stockmanship. It is usually hot, and the cattle do not want to move. You typically must move cattle through willows and boggy areas. However, our study (Bailey et al. 2008) showed that even college professors and students can readily achieve this goal if you apply the techniques developed by Bud Williams (Hibbard 2012). The study described by Bruegger (2012) showed that a student and college professor with no previous cattle handling experience could place cattle 2 miles from water and climb 1000 feet in elevation in a brushy mountain pasture in southern Arizona.

We do not believe, however, that herding cattle within a pasture to manipulate grazing distribution is a viable management practice unless the herders first learn and adopt the low-stress handling techniques developed by Bud Williams (Hibbard 2012). Without this training, cowboys, ranchers and other herders attempts at placing cattle would likely meet with failure and they would quickly grow tired of herding cattle. We expect they would become too frustrated. In contrast, people who have adopted these low-stress livestock handling techniques generally find herding cattle to achieve land management goals a rewarding and thoroughly enjoyable activity. Instead of a chore, herding becomes something to look forward to (and if done properly, the animals will look forward to it as well). The true key to success for integrating stockmanship into rangeland management is to have fun!

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