

Influence of Supplemental Feeding Sites on Use of Hardwood Rangeland Riparian Areas by Cattle¹

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Abstract: Over 3 years, typical cattle use on two range units left 50 percent of the riparian area with less than recommended amounts of residual dry matter (RDM). By relocating supplemental feeding sites away from these areas and into areas where high amounts of RDM were consistently left in the fall, the amount of cattle grazing in riparian areas was greatly reduced. In the 2 years of this study, use of traditional supplemental feeding locations resulted in 54 percent and 35 percent of the riparian areas being left with low amounts of RDM, contrasted to only 1 percent and 7 percent with low RDM in Range Units where new feeding locations were used.

Hardwood rangelands are composed of several different land classes which vary in the amount of forage produced. The dispersal of livestock is best correlated with the average annual forage production per acre of each land class and not with the amount of area of each "site" present. Livestock spend much more time grazing the most productive sites, the riparian areas, than they do on the less productive slopes (when the relationship of acres available to time spent grazing is examined) (Green and others 1958; Wagnon 1963, 1968).

On these rangelands the greater use of riparian areas by cattle can result in lower amounts of residual dry matter (RDM) at the end of the grazing season (Frost and others 1988). Residual dry matter is the dry plant material left on the ground from the current year's forage growth. Moderate amounts of RDM provide a favorable microenvironment for early seedling growth, soil protection, adequate soil organic matter and a source of low quality fall forage (Clawson and others 1982). Moderate levels of RDM for riparian areas on the San Joaquin Experimental Range have been determined to be 400 to 800 pounds per acre. During a 3-year supplemental feeding trial under typical feeding practices, one half of the riparian area was consistently left with low amounts (less than 400 pounds per acre) of RDM while less productive areas were left with high amounts (more than 800 pounds per acre) (Dunbar and others 1988). The low amounts of RDM do not provide the best microenvironment for seedling growth nor the best soil protection. A means of redistributing cattle use into less productive and underutilized areas and away from riparian areas would provide more favorable conditions for forage production and soil protection than currently exists in this situation.

We report the results of a 2-year study to determine whether the use of riparian areas, expressed in terms of RDM remaining in the fall, could be affected by a low cost change in a livestock management practice. Past investigations found that relocation of salt blocks was ineffective in changing the distribution of cattle (Wagnon 1968). We examined the relocation of supplemental feeding locations into areas previously mapped as consistently having high amounts of RDM.

Study Area

The San Joaquin Experimental Range is located 28 miles northeast of Fresno, California, in Madera County, near the center of the state and in the heart of the granitic soil section of the Sierra Nevada foothills. It supports an annual plant/oak (*Quercus* spp.) woodland type vegetation and is characterized by grassy,

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rolling hills with a scattering of trees and occasional dense stands of brush. It is in the lower part of the woodland zone between the treeless valley floor and the higher brush and timber belts. Tree species include blue oak (*Quercus douglasii*), interior live oak (*Quercus wislizenii*) and foothill pine (*Pinus sabiniana*). Annual precipitation averages 19 inches, with extremes of nine and 37 inches.

Range Units 1 and 8 were used during this study. Both Units are approximately 450 acres of which more than 5 percent is considered riparian area. The Units have been classified into the following sites:

Site	Range Unit 1	Range Unit 8
Riparian	6 pct	7 pct
Rolling, open	21 pct	5 pct
Rolling, rocky , brushy	73 pct	63 pct
Steep, rocky, brushy	0 pct	25 pct
	100 pct	100 pct

The San Joaquin Experimental Range is dissected by first-, second-, and third-order intermittent stream channels. In general, stream flow occurs during the rainy season and for a few weeks into the dry season. The majority of streambanks are vegetated by annual grasses and forbs. Stream bottoms are predominantly sand with some granitic rock and boulders.

Methods

During a 3-year study (1982-85) of range cow supplementation, the amount of RDM remaining in the fall was measured and mapped for Range Units 1 and 8 (Dunbar and others 1988; Frost and others 1988). This 3-year period identified a pattern of use for riparian areas in those units. These patterns were used as the baseline to determine the effect of relocating supplemental feeding locations on the distribution of cattle use.

Supplemental feeding locations were relocated in 1986-87 in Range Unit 1 to areas which were identified as consistently having high amounts of RDM remaining in the fall. Traditional feeding locations were used in Range Unit 8. In 1987-88 these treatments were reversed, with feeding locations relocated to high RDM areas in Range Unit 8, with the feeding locations in Range Unit 1 reverting to the traditional places. Treatment reversal was conducted as a means of eliminating the effect of current year weather and forage production as the cause of a shift in the distribution of cattle use. Annual precipitation and forage production were lower in 1986-87 and 1987-88 than in the years involved in the supplemental feeding trial (1982-85), which established the cattle use distribution patterns (*table 1*). Use by cattle (expressed as animal unit months or AUM's) was similar for all years:

	Range Unit 1 (use per year in AUM's)	Range Unit 8
1982-85 average	449	469
1986-87	432	444
1987-88	440	451

In October of each year, RDM was measured and mapped using categories of high, moderate, and low (Clawson and others 1982).

Table 1—Average forage production and precipitation at the San Joaquin Experimental Range, California.

Year	Production	Date of germinating rain	Total precipitation
	<i>lb/acre</i>		<i>inches</i>
1982-83	3,630	Sept 26	37.4
1983-84	1,824	Oct 1	16.3
1984-85	1,690	Oct 17	13.6
1985-86	968	Sept 28	11.9
1986-87	807	Oct 29	12.1
60-year avg	2,266	Oct 28	19.1

Amounts of RDM were determined by the comparative yield method (Haydock and Shaw 1975) and visual estimation. The acreages within each RDM class were mapped, measured, and expressed as percentages of total riparian area. These percentages were examined to determine whether the change in supplemental feeding locations produced a change in the use of riparian areas.

Results and Discussion

Traditional supplemental feeding locations in Range Units 1 and 8 resulted in approximately 50 percent of the riparian areas being left with low amounts of RDM in early October during a 3-year supplemental feeding trial (Dunbar and others 1988). These feeding locations were generally located close to sources of livestock water, salting locations, or existing roads.

Supplemental feeding locations in Range Unit 1 were changed in 1986-87 on the basis of the residual dry matter maps from the previous 3 years. The locations were placed in areas where moderate or high amounts of RDM were consistently left in the fall. The relocating of feeding locations resulted in a dramatic change in RDM levels in the riparian areas. The percentage of total riparian area with low amounts of RDM was reduced from 48 percent in the 3-year baseline period to only 1 percent in 1986-87 (*table 2*). The percentage of area with moderate RDM levels was also reduced from 39 percent to 27 percent, while the percentage of riparian area with high RDM amounts was increased from 13 percent to 72 percent (*table 2*). Traditional sites were utilized in Range Unit 8 in this year. Residual dry matter amounts and patterns were similar to those in the 3-year baseline period (*table 2*).

Table 2—Percentage of riparian area within RDM classes in early October.

Year and Unit	Amount of residual dry matter		
	Low	Moderate	High
	<i>pct</i>	<i>pct</i>	<i>pct</i>
1982-85 Range Unit 1	48	39	13
Range Unit 8	59	29	12
1986-87 Range Unit 1	1	27	72
Range Unit 8	54	33	13
1987-88 Range Unit 1	35	59	6
Range Unit 8	7	84	9

The following year, 1987-88, the Range Units were treated in the opposite manner. The supplemental feeding sites in Range Unit 8 were relocated into areas where moderate or high amounts of RDM were consistently left in the fall during the previous 4 years. This relocation resulted in a major change in the residual dry matter remaining in riparian areas. Less than 10 percent of the riparian area was left with low amounts of RDM, with more than 80 percent with moderate amounts. In Range Unit 1, where the feeding locations were placed back to the traditional sites, there was a greater percentage of riparian area with low RDM, more than 30 percent, with only 6 percent with high amounts of RDM.

These results, obtained in years of below-average forage production (*table 1*), indicate that cattle use can be manipulated through the location of supplemental feeding sites. On properly stocked rangeland, by moving supplemental feeding locations away from water sources and into areas where high amounts of RDM remain, the forage use in riparian areas of hardwood rangeland can be greatly reduced.

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