

Myers (1981) found that in the foothills of southwestern Montana, the frequency of hot-season use from July 10 to September 1 (period of heavy use) appeared to be a critical factor in developing and maintaining satisfactory riparian area conditions. Grazing systems with hot-season use in more than 1 year out of 3 or 4 met riparian habitat goals on only 24 percent of 21 streams. Grazing systems lacking hot-season use, or with no more than one hot-season treatment in 3 or 4 years, met riparian habitat management goals on 90 percent of 20 streams evaluated. Utilization data were not available in this study.

Myers (1989a) also analyzed duration of hot-season (7/1-9/15) grazing treatments and found that successful treatments averaged only 12.5 days, whereas unsuccessful treatments averaged 33.4 days. In this case, utilization of willows was important. However, duration was important from the standpoint of physical damage, regardless of utilization or regrowth potential, because of more frequent watering requirements and preference for shade while loafing. Duration of successful grazing treatments varied greatly depending on vegetation and stream type.

7. Deferment Until the Late Season (Fall Grazing)

Deferment is the postponement or delay of grazing to achieve a specific management objective (Forage and Grazing Terminology Committee 1991). Skovlin (1984) suggests that deferring use until the late season, until restoration of habitat is acceptable, offers a good measure of protection without great expense.

In fall, warm-season plants stop growing. Some cool-season species may grow where moisture and temperatures allow. Fall use is usually less critical than summer use because many perennial plants are completing their storage of carbohydrates and no longer need active leaf area. Upland cool-season species may again produce palatable forage, which, together with cooler temperatures, shifts livestock use to the uplands and relieves grazing pressure in riparian areas.

While livestock are often assumed to be leaving riparian areas to use upland range, that may not always be the case. On one study site in a long glaciated U-shaped valley in Idaho, Platts and Raleigh (1984) found that a late grazing system helped restore riparian quality because livestock moved to the uplands in late summer and fall when a cold air pocket formed over the bottomlands. However, at another study site in a flat, broad valley 15 miles away, livestock were drawn to the riparian areas during late season because those areas contained the only remaining succulent vegetation.

Heavy fall riparian use can leave streamside vegetation depleted and banks vulnerable to damage during spring runoff. Streambank damage relates to many factors, including soil moisture content, soil type, absence of woody plants and root systems, bank rock content, stock density, availability of off-stream water, and duration of grazing. Streambank damage due to livestock trampling of wet soils, and where other factors are not controlling, may be avoided by deferring grazing until bank soil moisture content is less than 10 percent. This usually occurs by late July or early August in most of the arid and semiarid western range (Marlow and Pogacnik 1985).

Deferring grazing until after seedripeness can benefit sedge/grass communities if sufficient regrowth (or residual vegetation) protects banks and retains sediment during the next high-flow event (Elmore and Kauffman 1994). Furthermore, woody species utilization must be carefully monitored because use often begins during the later part of the hot season when livestock tend to concentrate in riparian areas. Levels of utilization that maintain the diversity and productivity of meadow communities were found to retard woody plant succession on gravel bars (Green 1991). Kovalchik and Elmore (1991) noted that systems with late-season grazing are incompatible with willow management.

On the Smiths Fork Allotment in the Kemmerer Resource Area of the Rock Springs District in Wyoming, deferred grazing, together with good herding and salting practices, resulted in improved riparian and fish habitat in the Huff Creek drainage. Prior to treatment, Huff Creek was in a deteriorated state. It had changed from a cold-water fishery in good condition to a warm waterway with severe streambank erosion and excessive siltation. Willows had been replaced by sagebrush (Smith pers. comm.). During 1976 to 1979, in order to protect and enhance habitat for the rare Bear river cutthroat trout population, two exclosures were built, instream habitat improvement structures were added to one exclosure, and deferred grazing was initiated outside the exclosures (Figures 13 and 14). Livestock use in Huff Creek was limited to August 15 to September 30 each year. The range rider salted the ridges away from water and kept the 500 livestock distributed over the entire watershed. Livestock were moved away from the stream every 2 to 3 days, thus reducing impacts in the riparian area (Netherly and Hendersen pers. comm.).

The Wyoming Game and Fish Department monitored Huff Creek during 1978 to 1984 (Binns and Remmick 1986). As a result of the treatments and management applied in Huff Creek, trout habitat improved at all study stations inside and outside the



Figure 13. Riparian conditions in grazed area on Huff Creek below lower enclosure, July 1986.



Figure 14. Looking upstream into lower Huff Creek enclosure from grazed area, July 1986.

exclosures by 57 percent. Trout cover increased 214 percent. Bank stability improved except inside the small exclosure. Trout 6 inches and larger increased 300 percent in one exclosure, 92 percent in the other exclosure, and 72 percent in the grazed area. Field personnel credited the local grazing association's and range rider's control of the livestock as the key to riparian area improvement outside the exclosures.

8. Deferred and Rotational Deferred Grazing

Deferred grazing is a nonsystematic rotation with other land units, and rotational deferred grazing is the systematic rotation among land areas within a grazing management unit (Forage and Grazing Terminology Committee 1991). Both strategies have been successful in restoring and improving riparian areas. Deferred and rotational deferred grazing strategies are often combined with rotational stocking (rest-rotation). The common thread of successful application, except for riparian pastures used in a deferred strategy, has been to use many pastures to shorten duration of use and provide greater flexibility. Many riparian grazing successes in Montana use seven pastures or more (up to 38) (Massman ed. 1995). Masters et al. (1996b) concluded, "Four-pasture, five-pasture (or more) rotation schemes with no rested pasture may be more suitable to areas that require increased streambank vegetation. The additional pastures or smaller riparian pastures allow for a shorter grazing season and greater flexibility in rotation schedules."

One common problem in multiple-pasture systems is allowing livestock to drift between pastures rather than moving them in a timely fashion. In his evaluation of 30 grazing systems on 44 stream reaches in Montana, Myers (1981) concluded that livestock should be moved between pastures rather than left to drift over a period of

several days. In this analysis, riparian vegetative response seemed to be better in allotments where the livestock were moved and the gates closed, as opposed to the use of livestock drift and simultaneous use of two pastures. Other field personnel also emphasize the need to move livestock and not expect drift to accomplish the desired movement. Some livestock will stay in a pasture eating regrowth even though there is adequate palatable forage in the next pasture. One recommended approach, which can minimize livestock stress and encourage better dispersal, is to open the gate in late afternoon of day one, allow drift on day two, and clean the pasture and close the gate on day three (Hagener pers. comm.).

Based on research at the Red Bluff Research Ranch near Norris, Montana, Marlow (1985) suggests a grazing system based on seasonal preference for riparian and upland forage. In this area, livestock spend most of their time during June and July in the uplands, moving to the riparian sites in late July where they graze until October. Bank trampling damage is reduced by deferring grazing until after late July when soil moisture content had decreased to 8 to 10 percent or less. This system requires a minimum of three pastures and uses a 3-year cycle. Stocking rates in the pasture used first are based on forage available on both the upland and riparian sites. Stocking rates on the two pastures used later are based on 20 to 30 percent utilization of forage on only the riparian sites. Although this may appear to drastically limit the length of time a pasture can be used, riparian zones usually produce three to four times the forage of upland areas. The regrowth potential of riparian species is great enough that, during most years, regrazing of the same pasture can occur at 30- to 40-day intervals until frost. Consequently, there is little, if any, change in the amount of forage a rancher has available to his livestock in the grazing season. Once the target level of use is reached, livestock are moved to the next pasture. Each pasture receives 2 years of deferment during periods when soil moisture exceeds 10 percent (June-July). The pasture used early the first year is grazed progressively later during the second and third years.

Using riparian habitat as a key management area in conjunction with a deferred rotation grazing system has improved riparian area conditions on the Little Sandy Allotment in the Green River Resource Area of the Rock Springs District. This success is the result of sufficient flexibility, use supervision, and cooperation by permittees and the Wyoming Game and Fish Department. The sagebrush and grassland allotment is grazed by 2,500 cattle from May 1 to November 15 using five pastures, with riparian areas in each pasture. Herding and drift fencing control livestock movement from lower to higher range. Pasture moves are made so as to prevent adverse impacts in the riparian areas, avoiding bank trampling damage and excessive utilization. Sixty percent utilization of key herbaceous vegetation in riparian areas is used as a general rule to prompt pasture moves. One of the two lower pastures is always used first each spring due to elevational effects on range readiness, and the other is used last in the fall. Livestock graze the middle pasture twice per season going to and coming from the upper part of the allotment. They alternately graze the upper two pastures after seedripeness each year.

This management system has been in effect since 1980. Prior to that, bank trampling damage was evident, much of the streambanks lacked protective cover, plant