Managing Cows With Streams in Mind

By Pete Bengeyfield

Many streams in the West today have been damaged by livestock, resulting in broken banks; scraggly willows; wide, shallow channels; dirt in the stream; and weeds on the stream bank. I think we can all visualize the picture. But it doesn't have to be that way.

There are solutions to the riparian problems that are the flashpoint of so many battles in the West today. To be effective, the solutions have to be site-specific and feasible for management; they must also include a good dose of common sense. If any of these components are missing, the solution will likely fail. On the Beaverhead–Deerlodge National Forest in southwest Montana we think we've developed a mechanism that allows all these components to interact and create a situation in which streams can recover and stay healthy over the long term in the presence of livestock grazing. On one allotment, the results of this effort have initiated recovery in stream channels that were previously impacted by livestock, and are now in a decided upward trend.

Importance of Stream Channels

For years, much of the research associated with riparian areas concentrated on vegetation (willows, alders, cottonwoods, sedges) and the various benefits they provide. And there can be no doubt that the shade, cover, nutrients, and erosion prevention that occur as a result of having a healthy riparian plant community all combine to give riparian areas an importance disproportionate to their size in the arid Intermountain West. Consequently, when standards are developed to assess the impacts of livestock on riparian areas, they are often in terms of effects on vegetation.

Figure 1.

Ignored in all the attention on vegetation was the physical component of riparian systems, the stream channel. (The first widespread riparian assessment method to routinely

Figure 2.

include the stream channel, the Proper Functioning Condition methodology, didn't appear until 1993.) In reality it is the channel that collects and distributes water, making it perhaps the most important factor in whether or not plants are successful.

The stream channels we see on the landscape today have evolved based on the various climatic and geologic changes that have occurred over time. Their shapes, steepness, and sinuosity (how crooked they are) all combine to move water and sediment through the landscape in the most efficient manner. As by-products of this efficiency, they spread water throughout the valley bottoms, increase the storage of water in stream banks, and support streamside plants (which, in turn, keep their banks from eroding). Consequently, when setting standards for riparian condition, we need to look at the stream channel as well as at the streamside plants to determine when livestock need to be moved.

The key to maintaining the stream's efficiency, and thereby ensuring all the other benefits, is to make sure that the channel (shape, steepness, sinuosity) that should be on that site given the type of valley it's in, as well as its climatic and geologic history, is actually there.

Of all the indicators of a correct channel type, the channel cross-section—the relation between its width and depth—is perhaps the most revealing. For it is this relationship that determines whether or not the stream can perform the various tasks that lead to a healthy riparian area. Streams most affected by livestock occur in meadows, which are generally in fairly wide valley bottoms with little slope. This physical setting produces streams that are flat, crooked, narrow, and deep. Streams with these characteristics effectively move sediment because their velocity varies little across the channel; they reduce stream-bank erosion because they flood at regular intervals, thereby spreading out peak flows; they maintain saturated stream banks because they are deeper than they are wide, thereby supporting riparian vegetation with strong root systems; and they produce good fish habitat in the form of undercut banks. Figure 1 shows a well-functioning meadow-type stream of the kind that is most susceptible to livestock. It is narrow and deep, with dense willows and sedges on the banks, and these species extend outward to the change in slope that defines the floodplain.

This brings us back to where cows become important. The most widespread impact livestock have on riparian areas is trampling stream banks. Trampling can cause an increase in stream width, making the channel wider and shallower, with slower-moving water. As a result, sediment is deposited in the center of the channel rather than on the banks; less water gets to the floodplain so bank erosion increases; the storage of water in the banks decreases, forcing streamside plants to shift from willows and sedges to drier site species with less dense roots; and fish habitat is lost. Clearly, if we are going to maintain riparian areas, we are going to have to limit the amount of stream-bank alteration as a result of livestock trampling. Figure 2 shows a reach that has been heavily damaged by trampling. The stream is wide and shallow, with poor riparian vegetation on the stream banks, and it has a high amount of fine sediment in the channel bottom.

The Beaverhead Riparian Guidelines

When I came to the Beaverhead National Forest in 1984, my career up to that point had been spent on the "timber" forests west of the continental divide. I was familiar with the more traditional effects of Forest Service activities on streams—sediment from roads and increased water yield from timber harvest. The Beaverhead was a little different. The high elevation, cold climate, and sparse rainfall dictates that forests are more scattered and the trees small. So, on the Beaverhead, timber harvest doesn't affect a lot of streams.

But livestock grazing does. Livestock have been in southwest Montana since the 1860s, when they were brought in to feed the mining camps of Bannack and Virginia City. Virtually all of the Beaverhead Forest aside from the high alpine areas is in grazing allotments, and all of the streams for a good portion of their length are accessible to cows. Over the years of monitoring 382 permanently established cross-sections on meadow streams susceptible to livestock damage, significant changes have been shown at the 95% level. Streams became wider, and had higher levels of fine sediment and a greater stream-bank erosion hazard. This translates into 41% of those 382 stream reaches being classified as nonfunctioning or functioning at risk.[1]

To address this problem, Dan Svoboda, our soils scientist, and I developed the Beaverhead Riparian Guidelines.[2] These guidelines describe a process for moving livestock through the pasture rotation based on easily measured indicators that deal directly with livestock effects on stream channels and riparian vegetation. There are 4 indicators, which are measured to determine livestock movement: forage utilization, stubble height, woody browse, and streambank alteration. Measurement techniques are cited in the literature: stubble height;[3] riparian shrub utilization;[4] streambank alteration,[2] and forage utilization.[5] Site speci-

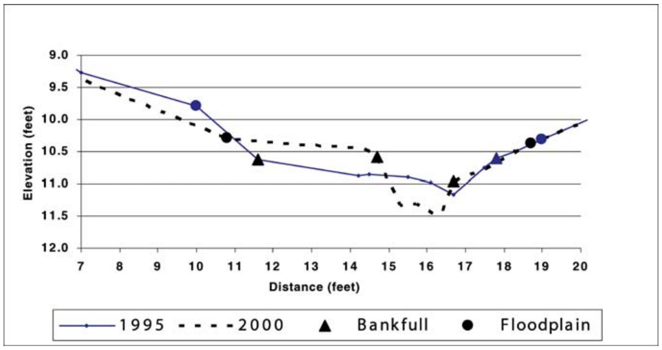

Figure 3.

ficity is stressed in each case, and the actual standard varies by stream type, vegetative type, and existing condition.

The following examples show how 2 streams on the Warm Springs Allotment, in the Ruby River watershed, have responded to the implementation of these guidelines over a period of 7 to 9 years. In 1993, the following levels for each indicator were prescribed for moving livestock: forage utilization, 50%; woody browse, change in livestock preference from grass to woody vegetation; streambank alteration, 30%; stubble height, 4 inches.

Results

The Warm Springs Allotment is located in the Gravelly Mountains, about 40 miles northwest of Yellowstone National Park. It is fairly high-elevation, open rangeland (70% suitable range) with patches of timber. Prior to the early 1990s, heavy grazing pressure was common in riparian areas, and many streams were in nonfunctioning or functioning-at-risk status as a result (Beaverhead–Deerlodge National Forest, unpublished data). There are approximately 5,900 AUMs on the allotment.

Permittees on the Warm Springs Allotment voluntarily began using the Guidelines to move cattle in 1993, and are responsible for the day-to-day monitoring and livestock movement. They employ 2 full-time riders who make liberal use of herding dogs. In 1995, stream surveys were installed throughout the allotment for the purpose of monitoring riparian recovery and function.

The Timber Creek site is on a reach of stream that was judged to be nonfunctioning in 1995 as a result of the cross-section becoming wider and shallower from livestock trampling of the stream banks. In 1995, stream-bank alteration (the linear distance along stream banks where livestock had caused stream widening through trampling during the current year) was consistently 80% or higher. Consequently, it was determined that livestock would be moved when stream-bank alteration reached 30%. In 2000, stream-bank alteration by livestock was 17%. After 7 years under the Guidelines, the cross-section had become deeper and narrower, and was beginning to resemble the shape of a channel that reference data from a similar valley bottom shows should occupy this site. The width of the channel had been cut in half (4.1 feet to 2.0 feet), and deposition had begun to develop a floodplain on the left bank. Vegetation in the form of sedges colonized the deposition, leading to further stabilization. Figure 3 displays the change in cross-section between 1995 and 2000.

Sawlog Creek is another stream on the Warm Springs Allotment that was impacted as a result of stream-bank trampling by livestock. Trampling was measured at 45% in 1995, and again it was determined that livestock would be moved when stream-bank alteration reached 30%. In 2001, stream-bank alteration by livestock was 15% in this reach.

Changes in the stream cross-section at Sawlog Creek were similar to those at Timber Creek, but perhaps a better indicator of the effects of the reduction in trampling on Sawlog Creek is the graph in Figure 4. This graph shows the distribution of 50 stream widths along approximately 200 feet of Sawlog Creek. The horizontal axis portrays the range of widths, and the vertical axis shows how often any given width occurs. For example, in 1995 (the solid line), 50% of the reach was about 5.8 feet wide or less. By 2001 (the dashed line), the channel had narrowed so that 50% of the reach was about 3.3 feet wide or less. This method of displaying changes in stream width shows that reducing stream-bank trampling over a period of 5 years allowed the channel to become narrower for a considerable distance.

Discussion

When the Guidelines were first used on the Warm Springs Allotment, each of the 4 "triggers" (forage utilization, woody browse, stubble height, and stream-bank alteration) was measured to establish which one would be used to move livestock. In each case, stream-bank alteration was the one that came into play first, and the one that was established as the long-term indicator that would require livestock to be moved. It should be noted that the consistent movement of livestock throughout the grazing season allowed the standard to be achieved with a wide margin of success. Although it was permitted to have 30% stream-bank alteration on Sawlog and Timber creeks, when the allotted time in the pasture was up, actual stream-bank alteration was consistent-

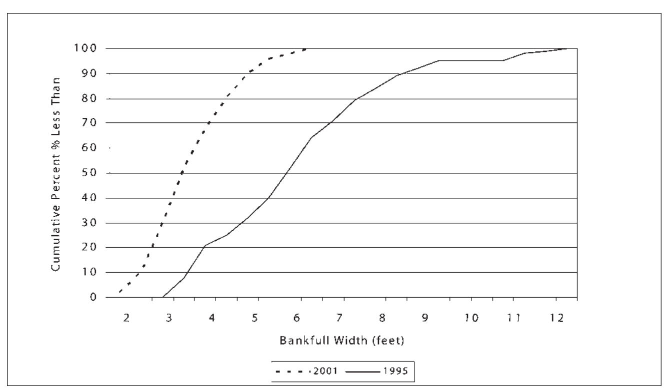

Figure 4.

ly in the 15%–20% range. In other words, by moving livestock and meeting the stream-bank alteration standards, the permittees were able to utilize a pasture for the full time.

Although the amount of improvement differed from site to site, an upward trend in the shape of the stream channel occurred where the Guidelines were met. These responses were evident over a 4- to 6-year period. Generally, stream width became narrower, forcing the channel to become deeper at the same time. In each case, vegetation improvements kept pace with physical changes as sedges became established on stream banks.

The improvement of these streams was brought about by an increase in livestock management by the permittees. Cows were gathered in small bunches and herded away from riparian areas to locations where they would remain for a period of days. Eventually, they would drift back to the riparian areas, where they would be gathered and moved again. A key in the effectiveness of this tactic was the large amount of suitable range (nontimbered areas with adequate forage) on the allotment. Allotments that have most of the suitable forage concentrated in riparian areas, are substantially timbered, and have limited off-site water, will be far more difficult to manage.

The positive effects of having a stream-bank alteration standard can be seen across the forest as well as on an individual allotment. Each year the Beaverhead–Deerlodge randomly chooses one allotment per ranger district for an end-of-season review. The goals of these reviews are to determine the following: 1) if the standards are being met, and 2) if they are being met, whether or not the streams are improving.

By combining the results of the 1999 and 2000 end-of-season reviews it is possible to assess compliance on 72 measurements of forage utilization, stubble height, and stream-bank alteration for 14 stream reaches. The average utilization standard was 45%, and this level was achieved in 59% of the cases. Stubble height standards averaged 4 inches and were achieved in 60% of the cases. Stream-bank alteration standards averaged 23%, and were achieved in only 28% of the cases. It appears that the forage utilization and stubble height standards, both of which were set at levels that are common throughout the West, are easier to meet than is the bank alteration standard. However, the only streams that showed significant improvement were those where the stream-bank alteration levels were met. Neither a forage utilization of 45% nor a stubble height at 4 inches initiated the upward trend in stream channel shape that is necessary to achieve riparian function.

Conclusions

Riparian improvements similar to those on the Warm Springs Allotment have occurred on other allotments on the Beaverhead–Deerlodge where the riparian guidelines have been successfully implemented. Here are some lessons we've learned that might be helpful to others around the West:

1. The Beaverhead Riparian Guidelines are an effective tool to improve nonfunctioning and functioning-at-risk riparian areas.
2. In many instances, stream-bank alteration is the most powerful of the triggers.
3. The key to successfully improving stream conditions in the presence of livestock is having the commitment of the agencies, the permittees and riders, and the interested public.

The importance of the third lesson cannot be overstated. Having a workable, site-specific proposal will look good on paper. Having all the parties support the solution will make the ground look good as well.

This conflict over riparian areas isn't going to go away anytime soon. The only way to diffuse it is to demonstrate that stream recovery to a functioning condition can be achieved in the presence of livestock. The Beaverhead Riparian Guidelines are one tool to accomplish that.

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