

Grazing and the Riparian Zone: Impact and Management Perspectives¹

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Abstract--Impacts of livestock overgrazing on riparian vegetation are magnified in arid and semi-arid regions. Typical stream habitat changes resulting from overgrazing of riparian vegetation, trampling of stream banks and increased erosion include: widening and shallowing of the stream bed, gradual stream channel trenching or braiding dependent upon soils and substrate composition, silt degradation of spawning and invertebrate food producing areas, loss of streamside and instream cover, increased water temperatures and velocities, decreased terrestrial food inputs, and a 3-4 fold decrease in trout biomass in grazed versus ungrazed areas. Recent livestock/fisheries study results and livestock grazing management options to repair, maintain and protect riparian habitats are presented.

A forum held in Denver, Colorado on November 3-4, 1978 brought together representatives of the livestock industry, range management agencies, fisheries and wildlife biologists, conservation organizations and the public. The forum was held to consider interactions between grazing and other riparian/stream ecosystem uses. Topics presented centered around the present condition of the public range lands, especially the riparian and stream habitats; recent trends in conditions; the relative impacts of grazing on riparian/stream ecosystems; and possible corrective measures. This paper presents the perspectives of two fisheries biologists on some of the issues raised at the forum and suggests some grazing management options to protect riparian/stream ecosystems from excessive grazing damage.

Nearly one-half of the total land area in the 11 western states is under Federal control, and more than 75% of this land is grazed by domestic livestock. It is our opinion that the use of public forage by private livestock is a valid and desirable use of these lands. Conflicts arise where livestock management practices ignore and/or destroy other equally

valuable uses of the resource. Overgrazing of rangeland in the U.S. has resulted in 70 percent of western grazing lands producing less than 50 percent of their forage potential (Dregne 1978). Many livestock men and range managers have protested that figures quoted from studies such as Dregne's are overinflated. However, the condition of public grazing lands and the need for range improvements and more effective grazing management practices was documented as recently as 1974. The Bureau of Land Management (1975) reported that only 27.6 million acres of public range were in good to excellent condition while 135.3 million acres were in the unsatisfactory categories of fair or poor condition.

The same BLM report summarizes trends in range condition as follows: "In 1932 it was estimated that the western range had lost nearly 50 percent of its original productivity. Valuable perennial vegetation which formerly protected the soil surface was destroyed and was replaced by invading annual grasses, brush, and weeds. Range depletion was especially serious around the permanent water-holes and generally resulted in replacement of palatable forage species with undesirable brush and unpalatable forage plants."

"The inevitable results of overuse and depletion of the range were decreased vegetation and forage, accelerated soil erosion and runoff, and instability of the livestock industry dependent upon the public domain. A vicious circle of increasing use of a decreasing forage

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supply resulting in further depletion was established and continued unbroken until passage of the Taylor Grazing Act in 1934 made possible the control and regulation of range use on the public domain. One hundred years was considered a minimum of time needed to restore the public land to its original productivity. Such improvement could be attained only through management of grazing use, permitting the natural range restorative forces to operate, and applying artificial revegetation and other conservation practices to that part of the range where practices were feasible" (BLM 1975).

"Piecemeal attacks on the range problem have been made in the past, but this report has been prepared in the belief that only a comprehensive attack on the entire range program will suffice. Many conditions, forces, and problems are common to the entire western range country. Only through consideration of the whole is it possible to obtain a background and a grasp which will permit sound and lasting remedial action." "This statement was made almost 39 years ago (April 28, 1932) on page 1 of Senate Document No. 199 entitled The Western Range and could be restated today without any changes" (BLM 1975).

Congress and the President authorized \$360 million this year for improvements on degraded public rangeland in the West. The monies were appropriated because of the Bureau of Land Management findings that 83% of the public grazing lands administered by BLM were in an unsatisfactory condition (GAO Report CED-77-88).

The overgrazing problem is focused most intensively on the productive riparian zone because livestock tend to concentrate along stream bottom lands. This situation is especially critical at lower elevations in arid and semi-arid regions where the grazing season is long and, by mid-summer, the only water and the majority of the palatable vegetation is found along streams. Other potential multiple use conflicts, such as logging, can occur and riparian communities still be preserved if certain guidelines pertaining to buffer strips are followed. There presently are no such guidelines or range management techniques in use short of fencing, that can protect riparian vegetation from overgrazing by domestic livestock.

The historic failure of Federal agencies to adequately protect the riparian zone of streams in livestock grazing areas, the common acceptance in range management practice that the riparian community is an unfortunate but unavoidable "sacrifice area," and the mass conversion in grazing practices to inadequately

tested rest-rotation systems, is leading toward legal confrontations.

Unfortunately, the issue is charged with emotion and opinions soon become polarized with a "choosing of sides." Hopefully, as more light and less heat are shed on the matter, progressive ranchers will realize that livestock, as well as other interests, have a great deal to gain from the reversal of the downward trend in the vegetative conditions of watersheds and the restoration of grasslands from millions of acres of relatively unproductive public rangelands. The rate of "desertification" of the American Southwest, in the last 100 years, has been far more rapid than in similar climatic areas of the world--and overgrazing by domestic livestock is the major contributing factor.

THE PROBLEM

In areas where forage and water are well dispersed throughout the watershed and grazing intensity is well managed, livestock grazing is not harmful and can even be beneficial to certain fishery and wildlife values. It is primarily in arid and semi-arid regions that riparian vegetation is highly susceptible to overgrazing. Once the vegetation canopy is removed, heavy rains are not absorbed by the soil and run overland causing erosion. When this occurs, the amplitudes of peak runoffs are tremendously increased. The energy created by the increased flood peaks often cause the stream channel to either trench down, creating an arroyo, or if bedrock is near the surface, the energy is dissipated by forcing the stream channel to spread out and braid. If the stream channel is lowered to form an arroyo, the water table drops and the productive, palatable, riparian vegetation is replaced with less productive, less palatable, more xeric species. In addition, the loss of riparian vegetation results in destabilized streambanks. These dramatic changes in the watersheds and aquatic environments of the American Southwest during the past 100 years have been the major cause of the widespread replacement of native fishes by introduced species (Miller 1961; Behnke 1977). More specifically, trout populations, are affected from the loss of riparian vegetation and destabilized streambanks by a modification of their physical habitat; their abundance is habitat limited. Optimal trout waters are characterized by slow, cool, deep water with abundant cover typical of undercut bank areas. Trout populations in these habitats expand their populations to the limits of their food supply; their abundance is often food limited.

Several investigators have reported on the impacts of livestock overgrazing on riparian/stream ecosystems (Dahlem in press; Keller et al. in press; Marcuson 1976; Martin in press; Storch in press; VanVelson in press; and Winegar 1977). Typical stream habitat changes associated with overgrazing reported by these authors include:

1. Widening and shallowing of the streambed;
2. Gradual stream channel trenching or braiding dependent upon soils and substrate composition;
3. Silt degradation of spawning and invertebrate food producing areas;
4. Loss of streamside and instream cover;
5. Increased water temperatures and velocities;
6. Decreased terrestrial food inputs;
7. Reduction of 3 to 4 fold in trout biomass in grazed versus ungrazed stream sections;

In addition, the same studies have indicated that different classes of riparian habitats exist with differing characteristic resistances to grazing impacts.

Some livestock interests maintain that domestic livestock grazing is not the major cause of degraded range conditions on public lands. They contend that the original damage was done by large free-roaming herds of bison and is perpetuated by uncontrolled grazing of ungulates such as deer, elk, feral horses, and burros. Human uses of public lands such as driving off-road vehicles, fishing, camping, and picnicking are also considered major contributors to the destruction of range and riparian conditions. These uses certainly contribute to the problem but the primary cause of the deterioration of western rangelands was, and is, overgrazing by domestic livestock. This was particularly true in the late 19th century, during the days of the open range. Many people dispute this conclusion, but the evidence is overwhelming. Bison herds have been gone from the western ranges for over 100 years, and early descriptions of the Great Plains and western rangelands describe their productivity in glowing terms. The comparison of riparian/stream conditions within fenced enclosures, which exclude grazing by domestic livestock but not wildlife, with unfenced adjacent grazed areas or a visit to Yellowstone National Park with its abundant wildlife but no domestic livestock use, strongly indicates that wildlife use is not a major contributor to the degradation of riparian/stream habitats. Public use and grazing by feral livestock, where they occur, are localized problems.

Hastings (1959) concluded, after reviewing pertinent literature on the subject, that arguing over the question of whether or not livestock grazing was the major cause of the accelerated erosion in the arid Southwest was "beating a dead horse." Dissmeyer (1976) examined the causes of accelerated erosion on a watershed and concluded that 92% of the damage was due to livestock grazing. There is no other reasonable conclusion; the evidence is overwhelming.

THE PRESENT

The days of the open range came to an end in the 1930's. Substantial improvements in range conditions have been made since then in some areas, although comparable improvements in riparian vegetation in areas exposed to livestock grazing have not occurred. Riparian conditions continue to decline in many grazing areas.

It is now known that riparian/stream areas protected from livestock grazing can be re-stored in a very few years. The reestablishment of grasses and forbs as vegetative cover, stabilization of streambanks, transformation of intermittent flows to perennial flows, and reduction of sediment loads quickly occur in areas protected from overgrazing by livestock. The process of riparian and stream deterioration can quickly and effectively be reversed (Heede 1976; Winegar 1977). Papers presented at the Sparks, Nevada Livestock-Wildlife-Fisheries Symposium in 1977 documented the rapid response (within 3 to 5 years) of stream sections protected from livestock grazing with resulting increases in trout biomass of 3 to 4 fold. VanVelson (in press) discussed the dramatic habitat improvements in Otter Creek, Nebraska, a small tributary to Lake McConaughy, after the riparian area was protected from grazing in 1969. The Otter Creek area had previously suffered from overgrazing and the warm, shallow, silted stream was virtually barren of fish. The Nebraska Game and Parks Commission leased the headwater area in 1969 and fenced out livestock. The stream rapidly recovered as riparian vegetation flourished. The new vegetation helped stabilize the streambanks, narrowed and deepened the channel, cooled the water, and provided cover. The water ran cool and clean and gravel beds were exposed that had been covered by silt deposits for years. Rainbow trout fingerlings and eggs from Lake McConaughy were planted in Otter Creek over the next few years. A self-sustaining migratory run of rainbow trout from Lake McConaughy had become established in Otter Creek and added 20,000 young fish (7-10 inches in length) to the lake fishery in 1974.

Winegar (1977) reported similar beneficial results to water flows and habitat quality for fish and wildlife in the livestock enclosure zone on Camp Creek, Oregon. The abundance and diversity of wildlife in the protected riparian area was much greater than in contiguous areas still grazed by livestock.

Duff (in press) reported that riparian vegetation, particularly sedges and grasses, were significantly more abundant inside an enclosure on Big Creek in Utah after four years of rest. This riparian area changed in four years from bare, sparsely covered banks to luxuriant grassy overhang banks. Native willow plants that were severely grazed, decadent, or hedged back to basal stems responded more slowly. Willow stems had just begun to emerge through the streambank grasses and had a mean height of 50 centimeters at the end of four years of rest.

The enclosure fence was cut in 1974, and trespass livestock use occurred inside the enclosure during May and June. The livestock completely eliminated the woody riparian vegetation (willows) and reduced the grass-sedge type to preenclosure conditions. Stabilizing streambanks were refractured and began crumbling into the stream. Overhanging streambanks were eliminated. Vegetative cover and soil stability ratings decreased by 35% and 14% respectively to ratings similar to previous conditions. This habitat damage occurred within just six weeks of uncontrolled grazing use.

THE FUTURE

The BLM must prepare 212 environmental impact statements on 150 million acres of grazing lands with 19,000 miles of streams and adjoining riparian areas in the 11 western states. We have seen some of the current draft EIS's and they clearly reflect a "business as usual" attitude in relation to livestock grazing on riparian areas. Inadequately tested rest-rotation grazing systems are being relied on to increase the animal unit months (AUM) of grazing on riparian areas and, at the same time, improve and maintain desirable riparian conditions. At the Sparks, Nevada symposium, it was stated by fisheries biologists experienced with rest-rotation grazing, such as Dr. William Platts, of the U.S. Forest Service, that high livestock density at certain times may cause more damage to the riparian/stream habitats than former grazing systems. The findings of Duff (above) tend to corroborate Dr. Platts' statement. One or two years rest will not restore the vigor of woody vegetation, such as willows and shrubs,

which are necessary to maintain stable streambanks and channels. It seems obvious to us that if the new BLM grazing proposals rely primarily on rest-rotation grazing systems, a continued downward trend will occur in the riparian vegetation with further reduction in fishery and wildlife habitat values.

Range managers and livestock interests have voiced the opinion that other public land use interests, primarily those of fisheries and wildlife, either want all livestock removed from public rangelands, or every mile of every stream on public lands fenced to exclude livestock. We do not believe that these are the goals of responsible fisheries and wildlife individuals or groups.

Fencing of streams is an effective means of restoring damaged riparian/stream ecosystems but is not a panacea for all of our range problems or the only possible management tool to protect valuable riparian/stream ecosystems. It also would be economically detrimental to permanently exclude livestock grazing from public lands or even from the highly productive and valuable riparian areas.

We suggest the following management options to help to resolve some of the areas of conflict concerning the use of riparian/stream ecosystems by domestic livestock.

1. Manage riparian areas for livestock grazing separately from upland range areas;
2. Fish and wildlife resources are of considerable economic value to the public sector. Some selected stream areas that are especially valuable to fisheries and wildlife resources should probably not be grazed. Other riparian areas should become fenced pastures to permit adequate control of livestock use.
3. Different classes of riparian habitats, such as forested, willow-shrub, and grass-forb types, should be identified and managed in accordance with their different degrees of resistance to livestock grazing.
4. When developing grazing management plans for riparian areas, the allocation of AUMs, season of grazing, and assignment of indicators to signal the time for removal of livestock should give reasonable consideration to protecting habitat features of value to the fisheries and wildlife resources of the area.
5. Fish and wildlife interests should not expect all riparian/stream habitats to be managed for maximum production of fish and wildlife. Some reasonable allocation of resource use and values are in order.
6. Livestock watering areas should be developed away from the riparian areas.
7. Spring areas should be fenced to protect their integrity with water for livestock

use piped outside of the fence.

8. Salt blocks should be located on up-land range areas away from the riparian areas.

9. Cattle herding may be a viable option to protect certain riparian/stream habitat classes.

10. It was brought out at the Denver meeting that selective breeding of cattle that are less attracted to riparian areas than others may offer a partial solution to the problem.

11. The Bureau of Land Management and the U.S. Forest Service should fund an interagency, interdisciplinary study of acceptable, innovative grazing management procedures for riparian/stream ecosystems. Such a study should include representatives of all public land use interests including livestock and conservation interests. We believe that the public rangelands may be able to support present densities of AUMs on a sustained basis if they can be brought back to full forage production and adequate protection given to the highly productive riparian/stream ecosystems.

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