much as 41 tons from 1976 through 1984, and the tributary channels as little as 10 tons (Table 3). In comparison, Piest, et al. (1975) reported that, on an average, about one-fifth of the total sediment yield from Iowa croplands resulted from gully erosion, with gully contribution approaching 50% of the observed sediment yield in individual cases.

Conclusions

Estimates of total sediment load, over a 9-yr period for a small gullied watershed, were partitioned to account for main gully contribution, tributary gully contribution, and upland erosion. These estimates were based on precise measurements of gully cross sections, comparisons of sediment yields of small gullied and ungullied watersheds, and USLE soil loss estimates. The main gully contributed about 50% of the total sediment yield. Estimates of upland erosion ranged from about 20% of the total based on the USLE to 40% based on comparison with an adjacent ungullied watershed. The remainder (10% to 30%) was attributed to contribution from tributary gullies.

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A Riparian Zone—One Story

Carl E. Bezanson and Lee E. Hughes

Riverbanks, streamsides, and wet meadows—riparian zones—have come to the attention of congressmen, public land managers, ecologists, ranchers, and conservationists. Proposed legislation dealing with the grazing fees on public land for 1988 addressed riparian areas for management emphasis. The pressure for government action is building to protect and manage riparian zones as very special areas, which indeed they are.

The Arizona Strip District (The Strip) of the Bureau of Land Management (BLM), that area found north of the Colorado River in northwestern Arizona, is not known for riparian areas. The Strip has relatively few springs and only three streams which pass through its bounds. The riparian areas comprise less than 1% of the Strip's 3 million acres. But the riparian areas and their water are immensely important on the ever-thirsty Strip.

A Brief Description

One important riparian area is the Paria River, which starts in southern Utah's plateau country and drains southward across the northeast corner of the Strip and barely flows into the Colorado River at Lees Ferry.

Ten miles above Lees Ferry the very narrow Paria Canyon significantly widens until its confluence with the Colorado River. This wide portion of the canyon has sandy slopes covered with desert grasses and browse such as Indian ricegrass and four-wing saltbush. The slopes all drain toward the Paria River, where water, feed, and shade from cottonwoods and willows exist.

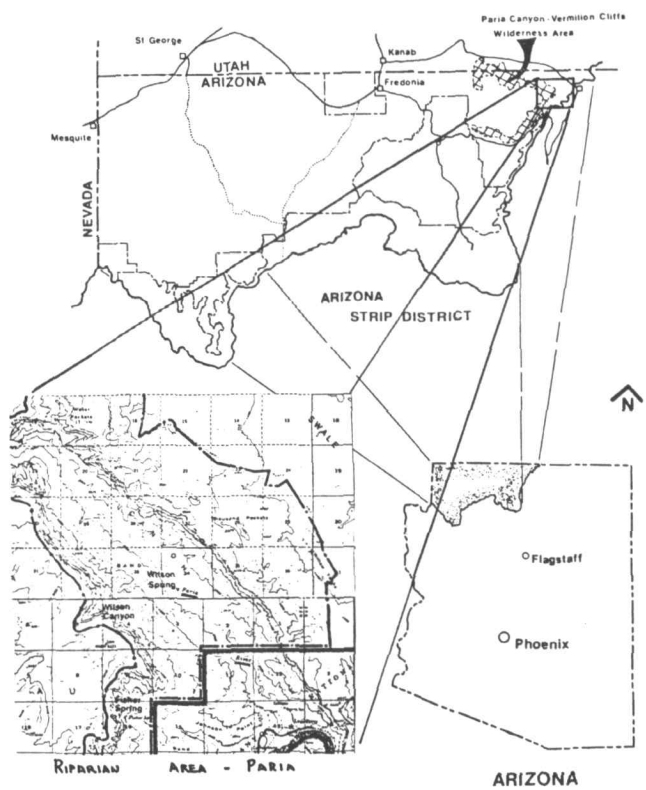
In 1976 the 850-acre riparian zone along the Paria looked desolate: it was well trampled and heavily utilized by livestock. Outdoor enthusiasts, while hiking the slickrock Paria Canyon, objected to this condition of the riparian zone.

Carl E. Bezanson was formerly range conservationist on the Arizona Strip District and now holds the same position on the Carson City District in Nevada. Lee E. Hughes is the district range conservationist for the Arizona Strip District.

A Change

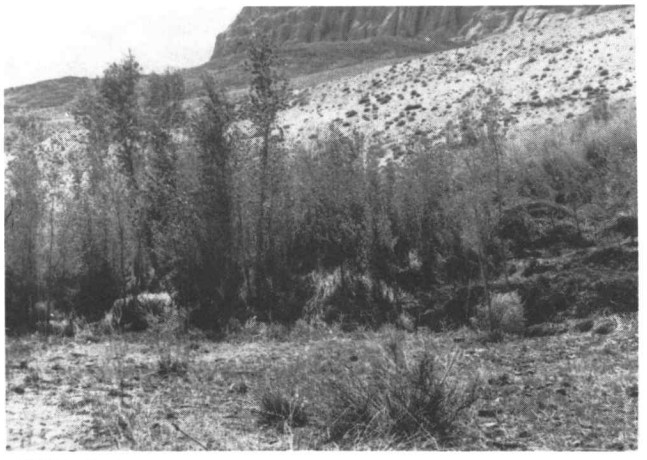
In 1979 The Strip evaluated its grazing program through an environmental impact statement. Following this effort, management changes were put in effect in the early 1980s through an all allotment management plan.

The objective of the allotment management plan and its



LOCATION MAP

1976—*A destroyed bank on the creek. No young cottonwoods.*



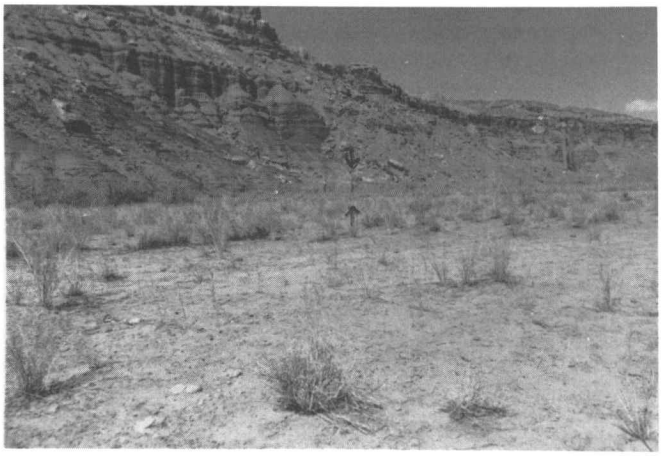
1987—*Note regrowth of young cottonwood, after 4 years of the grazing system.*

Note:1976 photographs taken with wide angle lens (28mm), 1987 photographs were taken with a 50mm lens. Arrow indicates same location in photographs.

grazing system was, and is, to promote the establishment and growth of young cottonwoods. Traditional grazing systems seemed to offer little in this regard. The reason for this thinking is that in riparian areas on The Strip—that had been fenced and protected six to eight years—no young cottonwoods had sprouted. This was the case also where protected areas had adult cottonwoods for a seed source and rootstock. Thus, with this experience, logic would predict that if protection wouldn't promote cottonwood sprouting, a grazing system surely would fail. The Strip, however, still opted for a grazing system with long rest periods in hope that rest would allow cottonwood sprouting.

The Solution

In 1983, the grazing system was put into effect that changed cattle use from an authorized 94 head and yearlong use to a rest-rotation grazing system. The grazing system allows 100 head of cattle to graze two years during a November through January period with total rest from grazing during the third year. This system, allowing six months of grazing and 30 months of rest from grazing in the riparian zone during a three-year period, has resulted in considerable improvement of the riparian zone.



1976—*Vegetation has been removed by heavy grazing.*

1987—*Vegetation just above the river is recovering well after 4 years of the grazing system.*

When the cattle return for the 3-month grazing period they still graze the riparian vegetation. The shade and streamside vegetation provide cattle a welcome variety from the desert grass in the canyon.

It must be said that livestock was not the only cause for degradation of the riparian zone in Paria Canyon. Large, scouring flashfloods have reduced cottonwood and willow populations, leaving a sterile looking drainage until recovery of stream bank vegetation.

A Final Note

The BLM's grazing system after one and one-half cycles (4 years) has promoted the sprouting of young cottonwoods. This was, and is, an objective of the grazing plan. The rancher cooperated with the BLM by reducing, in a most significant manner, the amount of time his cattle spend in the riparian area. Because of both actions and cooperation, one more BLM riparian area is in better condition and improving.

Our experience supports what was recently stated by the U.S. General Accounting Office in its testimony to Congress (3/1/88). "First, even badly damaged riparian areas can be restored. Second, there is no mystery on how to achieve restoration. The solution centers on controlling grazing through improved livestock management."