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Abstract.—Sediment and salt are important but often ignored contributions to nonpoint pollution in the semiarid western USA. Accelerated erosion and sediment/salt in stream flow are often thought to be caused by livestock grazing on rangeland in less than excellent condition. Poor condition streams are often downcut and show active bank rilling, bank sloughing, and piping. Lateral movements of gullies away from downcut streams through upland ecosystems are, in addition, contributing sources for increased sediment/salt pollution. Equally important, when downcut streams occur, associated riparian vegetation is often reduced in areal distribution, disappears, or is replaced by pseudoriparian plant species. Loss of riparian vegetation and the hydrologic support of limited riparian ecosystems may further reduce stream channel stability and sediment/salt trapping efficiency of the stream. These nonpoint source pollutants are transported to the stream by overland flow and ground water. With the value of stream and riparian zone stability in mind, the University of Wyoming, U. S. Bureau of Land Management, ranchers, and state agencies initiated a study in the cold desert of south central Wyoming.

This study was located along Muddy Creek between Rawlins and Baggs, Wyoming and was designed to:

(1) Evaluate the use of wire faced dams to enhance the restoration of a degraded stream channel reach and thus the adjoining riparian zones.

(2) Evaluate the amount of sediment and salt stored by riparian zones along Muddy Creek.

(3) Evaluate the surface and ground water regimes associated with degraded, improving, and improved stream channel reaches along Muddy Creek.

(4) Evaluate vegetation response between a degraded and improving stream reach along Muddy Creek.

(5) Compare economic returns of riparian zones supported by different stream channel conditions to the cost of restoring them using sediment, salts, vegetation, and stored ground water.

Preliminary results show that riparian zones filter sediment from streamflow. Diversion and flood irrigation, flooding by beaver dams, and water spreading controlled by dikes have been successful in creating a surface aquifer/-riparian zone in a desert ecosystem that is valuable for reducing nonpoint pollution and for prolonged storage of water during late summer months. Sediment can be trapped and vegetation production increased using wire faced dams in desert streams. Because of confining bed material under and along the existing channel, storage of water and creation of surfaced aquifer with dams was limited to the sediment storage capacity within the existing downcut stream channel. Both water diversion and damming of streamflow show improvement in riparian zone vegetation and control of nonpoint pollution when compared to a degraded stream reach.

Our study shows that stored sediment, trapped salts, increase in vegetation, and perhaps stored water in riparian zones, when using wire faced dams, will provide benefits sufficient to cover cost of construction and maintenance for federal and state agencies as well as municipalities but not the private producer. However, water diversion, water spreading, and creating a surface aquifer may increase riparian vegetation and store water sufficient to pay back the investment for these water development practices used in the past by private land owners.