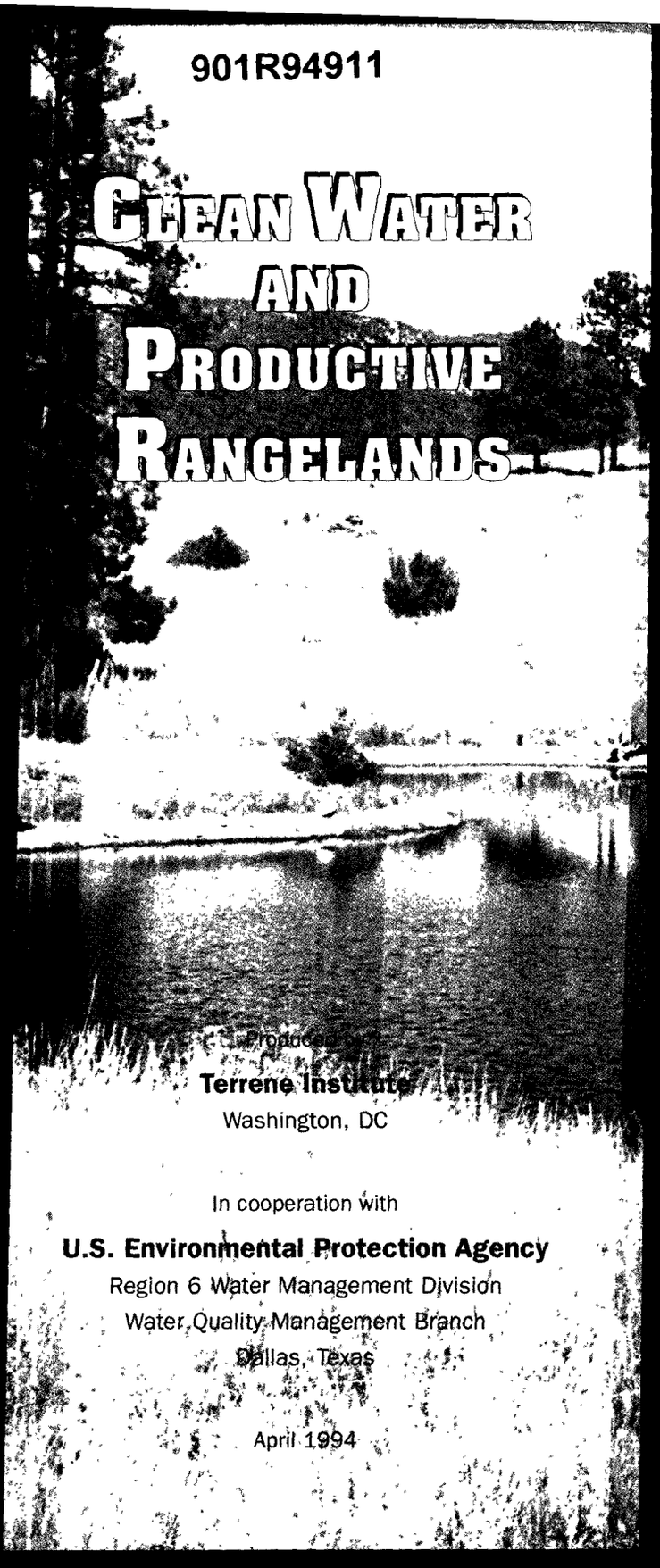
Clean Water and Productive Rangelands



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Rolling hills and vast prairies covered with grass. Bubbling springs and cool streams lined with cottonwood and willow. An upland savanna of scattered piñon, ponderosa, and juniper. Conifer forests on cool mountain tops and north slopes. This mosaic of greens, golds, and purples was once the American Southwest.

For hundreds of years, a diverse and balanced landscape supported herds of nomadic grazing animals and Native American settlements, greeting the first Hispanic and Anglo explorers and southwestern ranchers.

THE PROBLEM

But today, many western watersheds are no longer as healthy, dynamic, or balanced. Invading brush and noxious weeds infest the prairies and savannas. Streams that flowed year-round have dried to a seasonal trickle. Choked with sediment from eroding streambanks and uplands or lowered water tables from stream down cutting, streams can no longer support fish or provide water for livestock and humans. As the land's overall carrying capacity declines, the resulting economic changes threaten the livelihood of those who depend on the land for their income.

Many factors led to this dramatic decline in western rangeland productivity and water quality over the past 150 years, including overall inadequate watershed management. Past and current land management practices that contribute to this decline include

- increasingly efficient wildfire suppression since the early 1900s,
- heavy stocking in the late 1800s,
- abandoned mines,
- improper timber harvesting,
- increasing impact of recreational uses,
- traditional year-long grazing,
- access by public and private roads and off-road vehicles, and
- natural drought cycles.

Unfortunately, the resources for rangeland rehabilitation have not kept pace with the need. The downward trend in watershed conditions and subsequent nonpoint source pollution acceleration has continued. Table 1 summarizes some changes that result from improper watershed management.

These elements most visibly affect riparian areas, which the public often uses more heavily than upland areas. Riparian conditions mold the opinions of environmental scientists, fish and wildlife biologists, and the public about the land stewardship commitment of ranchers. So while today's ranchers must deal with resources very different than those of 150 years ago, they must also face a vocal and active public concerned with environmental protection in an increasingly complex economic climate.

How can the needs, rights, and responsibilities of private and public land ranchers be balanced with the public's need for livestock products, its right to clean water, and its responsibility to help protect it?

TABLE 1.—Inadequate rangeland management.

RESOURCE	EFFECTS
Riparian and upland vegetation	Loss or change in type of streamside vegetation or lowering of water table
Riparian and upland wildlife	Decrease or change in number and types of mammals, reptiles, and birds, including game wildlife
Fish and benthic community	Decrease in species composition from higher quality organisms to those tolerant of warmer temperatures, reduced shade, higher water velocity, increased turbidity or bottom sedimentation, and wider water flow fluctuations
Streambanks	Loss or deteriorating bank vegetation, sloughing; changed bank shape, slope, and water storage capacity; increased erosion and sedimentation from denuded bank
Livestock production	Reduction in weights, reproductive efficiency, and overall condition
Water quality	Temperature increase, clarity reduction, and increase in algae or other nuisance aquatic weed and plant growth, bacterial levels, and salinity
Soils	Upland soil erosion and heavy soil particle (sand) deposits in bottomland areas result in decreased soil productivity, water infiltration, and organic matter
Water flow	Decrease during most of the year but velocity and volume increase during storms

CAUSE
Continuous clipping of more palatable, highly nutritious plant growth exposes topsoil to erosive forces and results in invasion of less desirable species and less infiltration in upland soils
Reduced water flow; higher air, water, and soil temperatures from reduced shade; and change in plants needed for food and cover
Riparian tree and shrub loss and erratic hydrologic cycles — including decreased upland soil infiltration capacity — cause conditions unfavorable to healthy reproducing fish and fish food species (see water flow)
Removal of stabilizing plants and bank trampling or shearing causes sloughing, excessive erosion, and changes to bank angle, stream channel, and water column shape
Increase in less desirable plants from shrub intrusion and uneven range use
Temperature change from reduced shading after riparian plant loss; clarity decrease from suspended sediment originating from eroding streambanks and uplands; algae bacteria and nutrients from livestock with unlimited stream access
Changes in plant species and density result in nutrient and moisture loss, exposing bare soil to erosive forces of wind and water
Removal of upland and bank vegetation causes accelerated erosion of bare ground, reduces infiltration and percolation, and decreases the watershed's ability to store water and release it slowly throughout the season, thus changing stream from perennial to intermittent flow; Uncontrolled compaction can decrease rain and snow infiltration, increasing stream velocities during storms; These wide fluctuations in flow are especially damaging during droughts followed by sudden heavy rainfalls

How can the needs and rights of ranchers be balanced with the public's right to clean water?

The keys to resolving today's technical, social, and economic issues facing livestock producers are

- education of all interest groups,
- open and nonconfrontational discussion of controversial subjects, and
- a willingness to work cooperatively toward mutually agreeable goals in a realistic time frame.

A growing number of ranchers are balancing environmental considerations with maintaining and improving their economic conditions. They are demonstrating that, in many cases, changes in range management can prevent pollution and correct past damage to range and riparian areas.

The Carrizo Valley Ranch Experience

The Carrizo Valley Ranch has achieved a balance. After 35 years of careful range management, this 3,500-acre ranch in south central New Mexico can now sustain 100 head of beef cattle, an ample supply of clean water, a reproducing trout population (in favorable years), and trophy-sized deer and turkey.

The ranch was not always in this condition. In 1957 rancher Sid Goodloe began a series of actions designed to improve range conditions, but

that also improved water quality. They included riparian rehabilitation, brush management, and a modified short-duration grazing system.

The following describes a brush control system that works for Carrizo Valley. These techniques might be adaptable to similar ecosystems on ranches across the Southwest. Research shows that other rehabilitation systems may also be effective. However, once a ranch establishes a system, it must follow the system faithfully to be effective.

Wildfire suppression contributed greatly to the rangeland decline.

LESSON #1: Brush control, a never-ending chore, should be undertaken with caution.

Brush control steps at Carrizo Valley include

- Removing heavy stands of invading piñon and juniper by two-way chaining or dozing and piling
- Prescribed burning following mechanical treatment
- Reseeding the range to a mix of native climax community (final stage of ecological succession) grass species

Carrizo Valley faithfully maintains a strict regime to rehabilitate bare ground (top), including chaining and burning invading piñon and juniper (middle), and reseeding with a native climax community mix (bottom).

The final rehabilitation step is *maintenance* burning to control brush seedlings.

Implementing a short-duration rotational grazing system

Leaving standing large trees and wildlife corridors

Maintaining the range by spot treating with herbicide applied from a four-wheeler and periodic burning in three to six-year cycles—generally when fuel levels reach 3,000 pounds per acre or when brush seedling sprouts are clearly visible above grass tops

Following the entire rehabilitation sequence is critical.

- Without the prescribed burning and reseeding following chaining, the range can become more heavily covered with invading undesirable plants than before treatment.
- Without a rest-rotational grazing system, livestock will be drawn to the palatable new growth, canceling any positive effects of reseeding.
- Without complete periodic maintenance, including prescribed burns on rehabilitated range, the fuel load—wood, dead falls, and conifer needles—will increase to levels that would cause unacceptably hot wildfires, retarding grass recovery and destroying large trees and wildlife corridors.

Goodloe removes livestock from areas recently chained, burned, and reseeded for an entire growing season. On areas receiving a maintenance burn, however, he defers grazing only until indicator grasses are about 3 inches high and the soil is stable.

Selecting a rehabilitation area based on the area's present capability to recover is critical. Many heavily brush-infested areas have also suffered from severe soil erosion. The land surface, often devoid of topsoil or organic matter, has a low moisture holding capacity. Such areas are difficult and expensive to revegetate successfully in the best conditions.

In the arid western ecosystems where rainfall is sporadic but intense, invasive brush removal techniques such as chaining can do more harm than good to soil and water resources in certain areas. Selective cutting of brush and some timber on hilltops and steep slopes or leaving the brush intact may be preferable. In some cases, a carefully prepared controlled burn is useful, but only if enough topsoil remains in place to serve as a seedbed for grass plants.

LESSON #2: Don't depend on livestock sale profits to pay for watershed management work—use other resources.

Range rehabilitation is expensive. While long-term gains are usually worth the cost, outside capital is often needed. Carrizo Valley Ranch uses several techniques to provide extra income for watershed rehabilitation. They include

- Selectively cutting stands of ponderosa, piñon, and juniper to produce dimensional lumber from its one-worker sawmill

Selective timber cutting produces valuable lumber.

Firewood, fenceposts, and vigas (ceiling beams) bring in extra income.

Hunting lodge rental is another income source.

- Selling firewood, wooden fenceposts, and vigas—logs used for authentic southwestern ceilings
- Leasing a ranch hunting lodge to hunters during deer and turkey season

LESSON #3: If the land is stable and the livestock properly managed, riparian areas can be used for grazing.

Only after upland watershed rehabilitation work has begun and a planned grazing system installed should headcut gullies be stabilized. Use small earthen or timber dams or disposed brush and slash, followed by reseeding after the gully silts in.

Riparian areas need additional treatment. Carrizo Valley Ranch used silt moving from the upper watershed to create a wet, marshy area and pond in a dried streambed. The streambed was

stabilized with willow cuttings, native sedges, and rushes. After rehabilitation of the upper watershed, the stream—dry for more than 70 years—began to flow year-round, providing a stable moisture source for the new riparian vegetation.

After establishing trees and other vegetation, Carrizo Valley allows livestock some access during the dormant season. Limiting access during the growing season prevents the cattle—which in warm months tend to lounge in cool, shaded, moist areas—from trampling and overgrazing the forage. During winter, however, cattle move from the lower, colder riparian areas to the upland areas, sheltered near groves of trees. Flash grazing of riparian areas in the dormant season stimulates growth the following spring, leaving well-vegetated streambanks intact.

LESSON #4: Grazing management is generally an effective way to protect water quality, once rangelands are rehabilitated and stable.

Some range watersheds are so eroded or brush and weed covered that manipulating livestock numbers and grazing patterns alone cannot improve the area within a reasonable time period.

Livestock access to riparian areas is limited to flash grazing during the dormant season.

ıgeland and rest-rotation grazing has turned brush infested range (top left) into productive pastures (foreground).

Just 35 years ago, Carrizo Valley was in just such a degraded condition. Now the flexibility of the rest-rotation grazing system protects resources and maximizes livestock production.

Carrizo Valley uses a short-duration grazing system. One herd of about 100 cow/calf pairs graze in seven different pastures in spring and summer. In the fall, the pairs use a two-pasture rotational system; calves are normally sold by October. In winter, cows use one pasture and supplemental feed.

Cattle do not graze in the same pasture during the same portion of a season in any consecutive year. During the growing season, ranchers move cattle every week—sometimes as often as every two or three days—depending on moisture, grass, and soil condition. Carrizo Valley has found that once cattle are accustomed to rapid rotation, they seem to anticipate the move and require minimal encouragement when changing paddocks.

LESSON #5: Interconnected watershed management benefits many resources.

Ranchers need clean dependable water supplies for livestock, wildlife, and ranch use. Livestock and wildlife need enough nutritious forage to reproduce and thrive.

Grass and forbs protect soil from erosion, capture runoff, increase rainwater infiltration—necessary for forage growth—and protect water

quality by filtering and adsorbing pollutants. Ranchers must manage all resources in concert to ensure clean water, nutritious forage, adequate soil cover, and stable wildlife populations.

Diversification, development of an adaptable, low-maintenance cattle breed—the Alpine Black—and a long-term commitment to watershed rehabilitation has helped Carrizo Valley Ranch balance multiple uses and remain profitable. By demonstrating its time-tested successes, Carrizo Valley ranch has influenced management techniques on the adjacent Lincoln National Forest. Some consider the U.S. Forest Service's Carrizo Project, an ecosystem approach to watershed rehabilitation, as the bellwether for vegetation in soil management on public land with similar conditions in the Southwest (see Table 2).

The Carrizo Valley Ranch experience is not unique—many other western ranches have benefited from proper range management. Through a consistent and faithfully executed program, ranchers can balance growing environmental concerns with their own economic success.

Adequate water and productive rangelands produce a profitable operation at Carrizo Valley Ranch.

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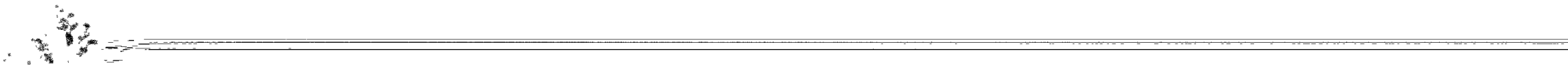

TABLE 2.—Rangeland watershed management benefits.

RESOURCE	EFFECTS	CAUSE
Riparian and upland vegetation	Increased density; variety of palatable grass and forb species	Adequate plant regrowth and reproduction time generally yields denser stands of native plant species
Riparian and upland wildlife	Wider variety of wildlife; improved game and nongame species survival; restored fisheries	Improved upland and riparian condition from adequate water better supports wildlife and fisheries by increasing low flows and raising water tables
Water quality	Decrease in temperature, nutrient and bacterial load; increase in clarity and dissolved oxygen	Decrease in water temperature from shade provided by riparian trees and shrubs and in nutrient and bacteria delivery to water from proper animal and watering facility management; increase in clarity from less erosion on well-vegetated soils and higher dissolved oxygen found in cooler water
Livestock production	Carrying capacity can increase, greater animal weights, and improved reproductive rates	Livestock rotation and a stable water supply allows improved and sustained production during droughts and in wet years
Streambanks	Stable and vegetated banks improve wildlife and fishery habitat and protect water quality	Less erosive and prone to collapse during storm events; effectively absorb and dissipate excess water
Soils	Stabilized, increase in organic matter and water infiltration	Native grass' long fibrous roots hold soil in place and maintain consistent soil moisture
Aesthetic values	Wide variety of plants growing on suitable soils	Well-vegetated and stable riparian areas provide a mosaic and varied herbaceous landscape, pleasing to the eye
Water flow and quantity	Greater water infiltration, increased aquifer recharge, more evenly moist deep soil, and more regular and even stream flow	Stable, well-vegetated, non-compacted soils provide air space, allowing increased water infiltration and stabilized stream flow
Additional income	Increased business for livestock producers and others in the watershed	Income opportunities from a variety of sources to avoid risks of single enterprise

HELP IS AVAILABLE

Ranchers can often use help with

- Developing grazing plans, brush management, and prescribed burning
- Designing livestock watering facilities and fences
- Economic analysis of various resource management projections and decisions
- Cataloging existing resources—land, water, wildlife
- Obtaining cost-share and other financial assistance for environmental improvement projects
- Determining possible environmental impacts of various resource management decisions

Consult the following sources for appropriate help

- Local Soil and Water Conservation District and Soil Conservation Service
- University range and wildlife departments
- State Cooperative Extension Service
- Private consultants
- Livestock associations
- State fish and game or wildlife agencies
- State water quality, environmental, or natural resources departments or agencies
- Tribal environmental offices
- U.S. Forest Service and state forestry departments
- Bureau of Land Management
- Bureau of Indian Affairs
- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency
- Farmers Home Administration
- U.S. Geologic Survey Office
- State water rights authority