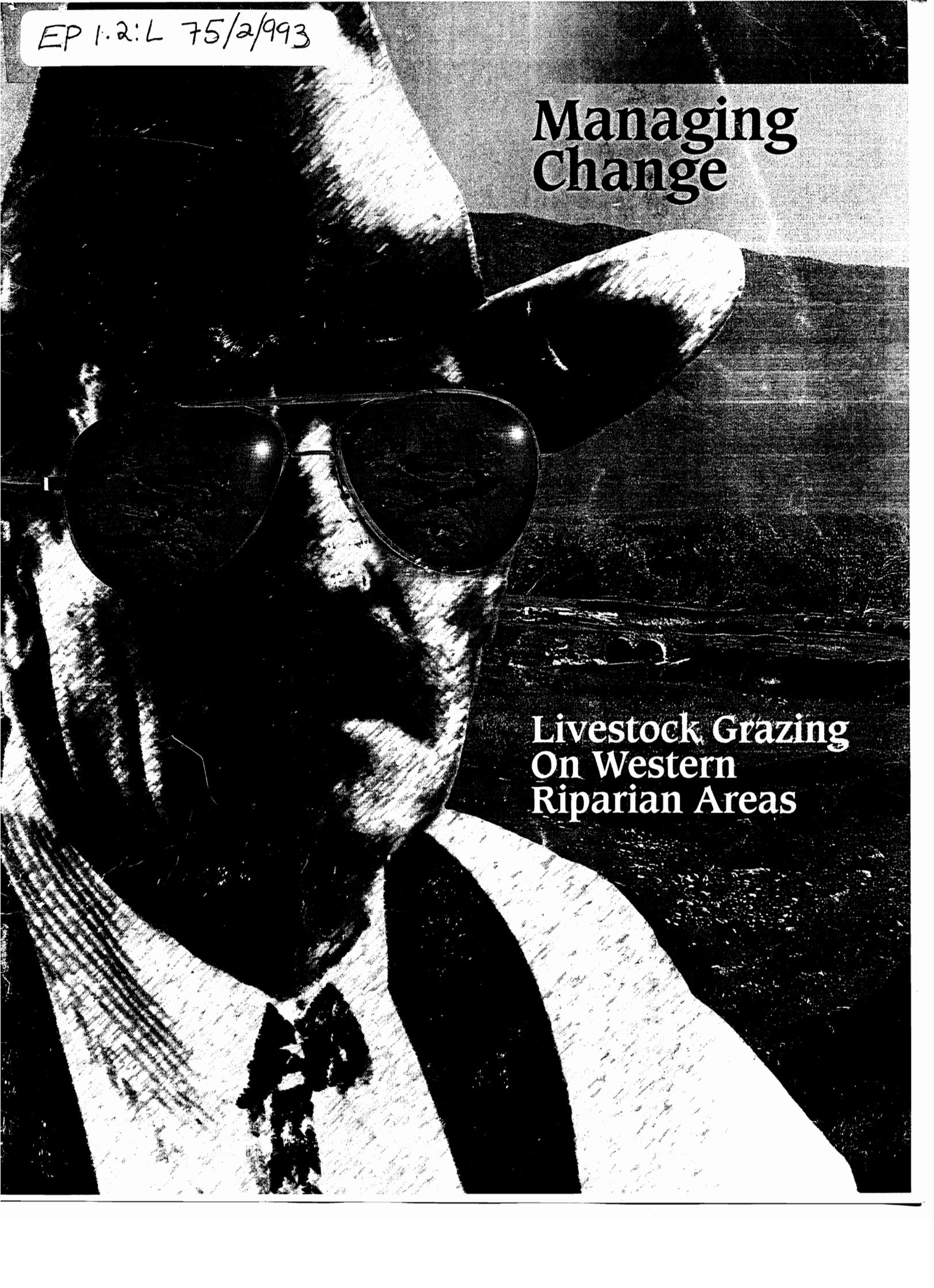


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Managing Change

Livestock Grazing
On Western
Riparian Areas



MANAGING CHANGE



Livestock Grazing on Western Riparian Areas

July 1993

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Foreword

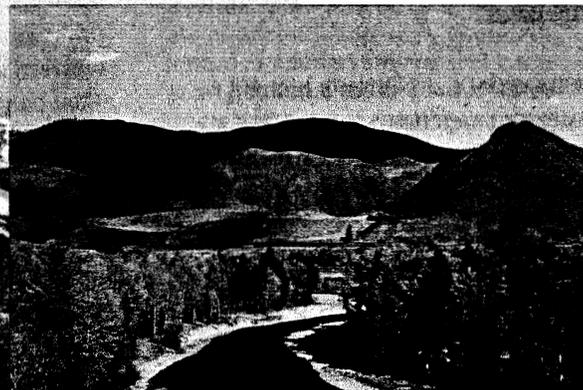
This document is written for the most important people in the growing national effort to enhance water quality on western rangeland water-

shed: the men and women who
work to improve the livestock.

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The Clean Water Act of 1977 established a national objective "...to restore and maintain the chemical, physical and biological integrity of the Nation's waters."

Initially the Act focused on easily identifiable "point sources" of water pollution. In 1987 it was amended to include "nonpoint" sources, broadly defined as any human-caused degradation of surface or groundwater, including that caused by livestock grazing.

Control of point sources of water pollution is mandatory and strictly regulated. The current approach to controlling nonpoint sources of water pollution generally is to seek voluntary compliance through non-regulatory programs of technical and financial assistance, training, technology transfer, demonstration projects and education.

As part of this effort, in 1990 the Environmental Protection Agency published *Livestock Grazing on Western Riparian Areas*. It provided a broad overview of functions and

values of western riparian areas, causes and effects of degraded riparian areas and water quality, and provided case studies representative of the problems and the opportunities for improving livestock grazing on western riparian areas.

This document is a sequel and companion piece to its predecessor. Together they are designed to foster broader understanding of how improved grazing management on western riparian areas can enhance water quality and overall productivity of rangeland watersheds.

Managing Change

Things are changing on western rangelands.

For much of the Nation's history, western rangelands were mostly thought of in terms of how much livestock grazing they provided.

Riparian areas - lands adjacent to streams where vegetation is strongly influenced by presence of water - may comprise less than 2% of total land area in the western U.S. For decades they generally were treated as "sacrifice areas" impractical to manage within context of vast uplands. Wetlands were "waste-lands" to be drained and put to productive use.

Those days are over.

Today one of the most powerful forces of change on the range is society's growing awareness of the value and vulnerability of western rangeland riparian areas and wetlands.

This awareness is being translated to a growing body of laws, policies and regulations. These require changes in rangeland grazing practices necessary to protect and enhance ecosystem diversity and water quality on rangeland watersheds.

Change, especially significant change, is difficult.

Political fireworks are inevitable when the irresistible force of change meets the immovable object of tradition.

However, many livestock operators have acknowledged the need for change. They are changing or beginning to think seriously about how to change their grazing

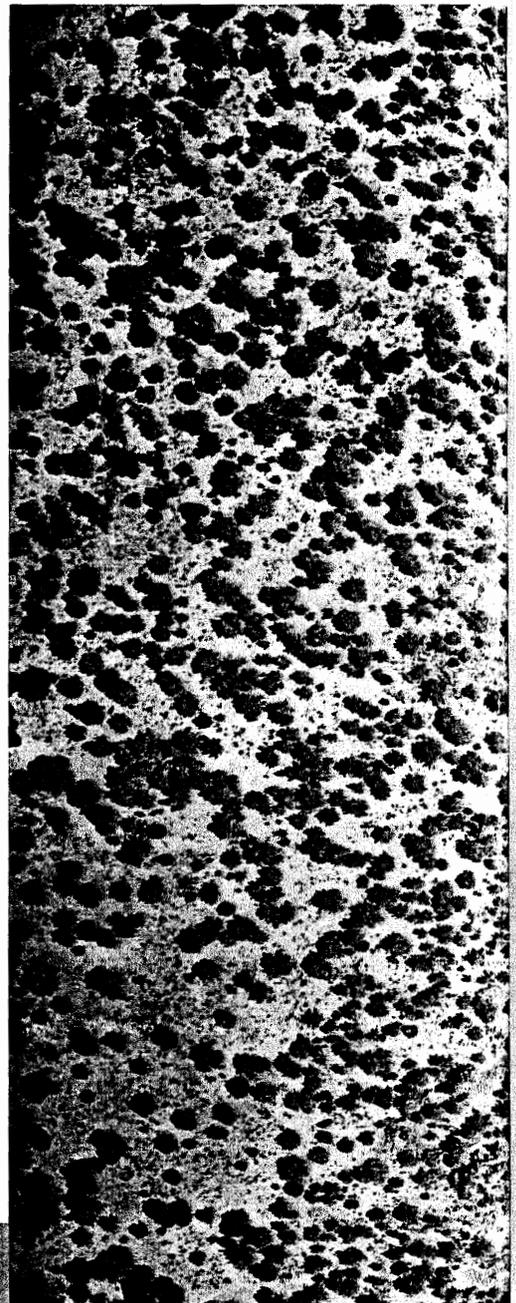
practices to improve riparian/wetland conditions.

This document doesn't attempt to provide a grazing strategy for every western rangeland riparian area. That can't be done through the mail. It has to be done on the ground, stream by stream, operator by operator.

In any event, a recipe book that attempted to cover even the most broadly representative riparian situations would be too heavy to ship UPS.

This booklet has modest objectives.

- To help the men and women who move the livestock look at their streams and riparian areas from a water quality and watershed perspective.
- To stimulate their thinking about how to change their livestock management to improve riparian/wetland conditions and water quality.
- To encourage them to take the first steps to get their degraded riparian areas and streams started on an improving trend.



The relationship between land management and water quality has long been recognized.

"To protect your rivers, protect your mountains."

—Emperor Yu of China, 1600 B.C.

"The wells are nearly all dried up and have to be dug deeper. At the present time the prospect for next year is a gloomy one for farmers and in fact, for all, for when the farmer is affected, all feel the effects. The stock raisers

here are preparing to drive their stock to where there is something to eat. This country, which was one of the best ranges for stock in the Territory, is now among the poorest: the myriads of sheep that have been herded here for the past few years, have almost destroyed our range."

—Salt Lake City Deseret News, 1879



Over much of the western United States riparian areas are thin lines of green (red in infrared photography) across vast arid and semi-arid uplands. Unregulated grazing in the late nineteenth and early twentieth centuries caused severe and long-lasting damage to rangeland watersheds throughout the West.

In the early days of regulated grazing on publicly-owned rangelands, it was considered impractical to manage riparian areas separately from the far more extensive uplands. Resources were not available to provide livestock water away from streams. Effort was made to lay out pastures with streams in the middle. In consequence, livestock tended to concentrate on and severely degrade riparian areas, streams and water quality.

For decades it was national policy to drain wetlands by channelizing streams. Times, attitudes and national policies have changed with increased knowledge of wetland values. Today wetlands are recognized as being among the most valuable and productive of all land types. Wetland vegetation protects streambanks and shorelines from erosion, slows flood flows, filters sediment, builds banks, captures and breaks down nutrients and water pollutants. Wetlands can store and slowly release water, extending the seasonal supply and enhancing its quality. Wetlands are critical in the life cycle of many species of fish and wildlife.



Why Change?

It's a reasonable question.

Why not just hunker down and resist the tide of change sweeping western rangelands? Maybe it will pass over and leave things pretty much the way they are.

Thoughtful livestock operators aren't betting on it. They find good reasons to get out in front of, and manage, change.

It's Good Business

If your riparian areas are in bad condition, chances are good you are missing an opportunity to make more money.

Riparian areas typically are much more productive than an equivalent amount of adjacent upland. Improper grazing reduces the amount of forage produced on your most productive land. You lose money.

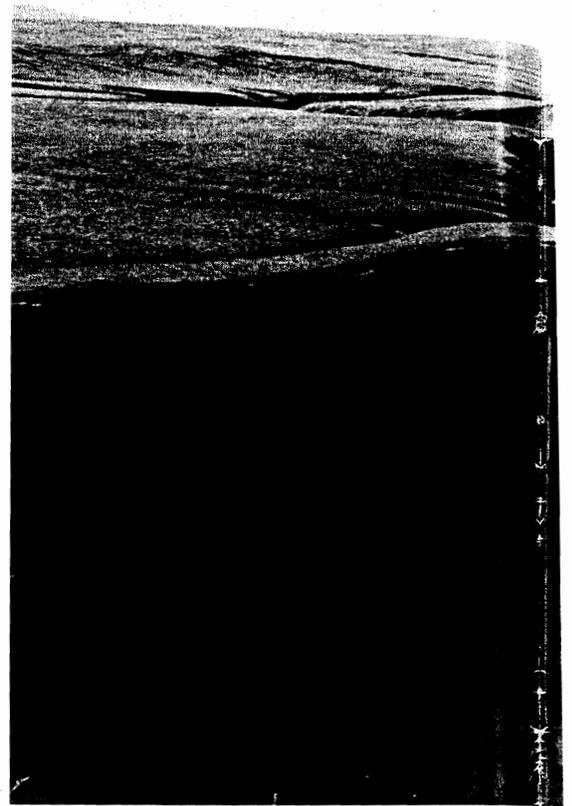
Cattle are attracted to and tend to loaf in riparian areas, particularly after upland forage dries out. Riparian vegetation can be severely overgrazed. The much more abundant upland forage can be significantly underutilized. You lose money.

Overgrazing riparian vegetation makes streambanks more vulnerable to the destabilizing effects of livestock trampling and the erosive force of water, exposes soils to drying out by wind and sunlight, reduces water storage capacity of the riparian area, reduces shade and thereby increases stream water temperature, encourages invasion of undesirable plants, speeds up runoff, and reduces filtration of sediment necessary for building streambanks, wet meadows and floodplains.

These things typically result in loss of livestock forage, reduced numbers and diversity of fish and wildlife, degraded water quality, reduced property value, and frequently cause serious property damage. You lose money.

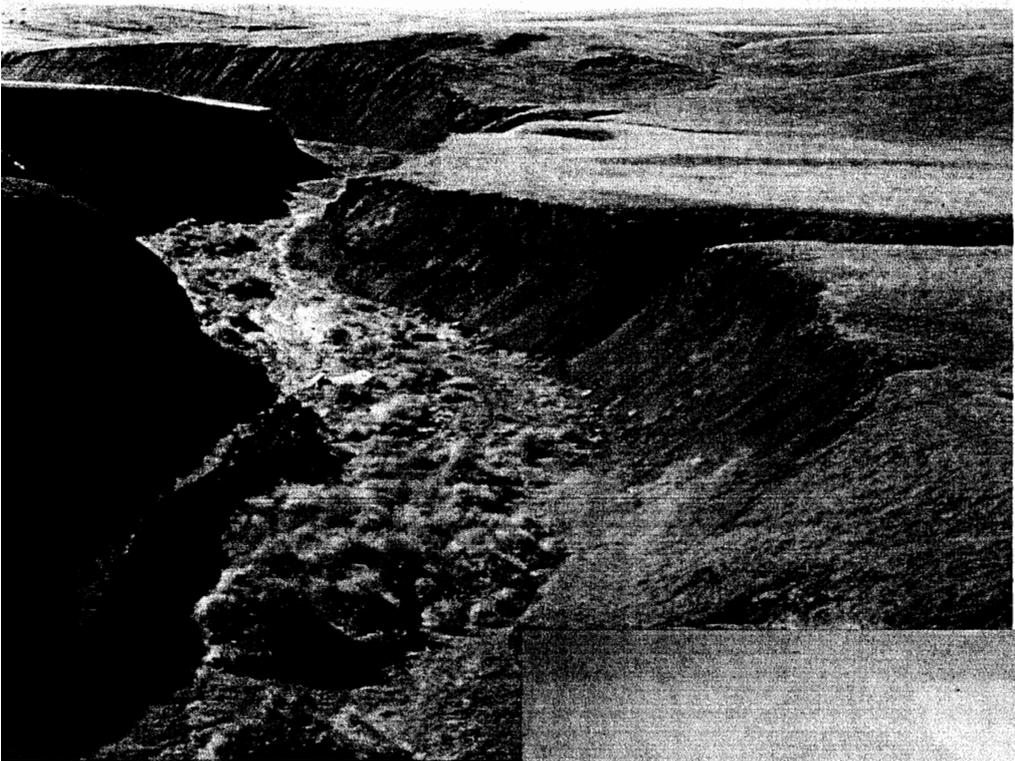
The photos to the right are of two privately-owned places of similar potential in the same watershed. It doesn't take a rocket scientist to see which is the most economically productive, or which a buyer would pay the most for.

The photos below are of a public land grazing allotment. It is evident which condition is capable of producing the most livestock forage and the least headaches with the land management agency and the public.



Below Poor upland and riparian grazing management reduced forage production, eroded streambanks, reduced streamflows, increased water temperatures and sediment load, jeopardized a threatened migratory trout population, and created costly headaches for the permittee and land management agency.





Left Poor grazing management severely reduced the economic productivity of this ranch. Removal of upland vegetation accelerated runoff. Along with removal of riparian vegetation this resulted in channel downcutting and lowered water table. Downstream neighbors are stuck with the costs of increased sediment and accelerated runoff.

Below What the land in the above photo could look like with good grazing management and consideration for downstream neighbors.



Below Ten years of rest from grazing restored this area's riparian area, water quality and economic productivity.



It's Good Citizenship

Proper grazing practices on upland and riparian areas of western rangelands are, above all else, a matter of good citizenship.

It's really pretty simple.

The costs of degraded riparian areas and unstable stream channels don't stop on-site. They are transferred to your downstream neighbors. And to future generations of downstream neighbors. Some of whom may be thousands of miles away. A watershed can be a big neighborhood. From a watershed/water quality perspective, livestock grazers are their neighbors' keeper.

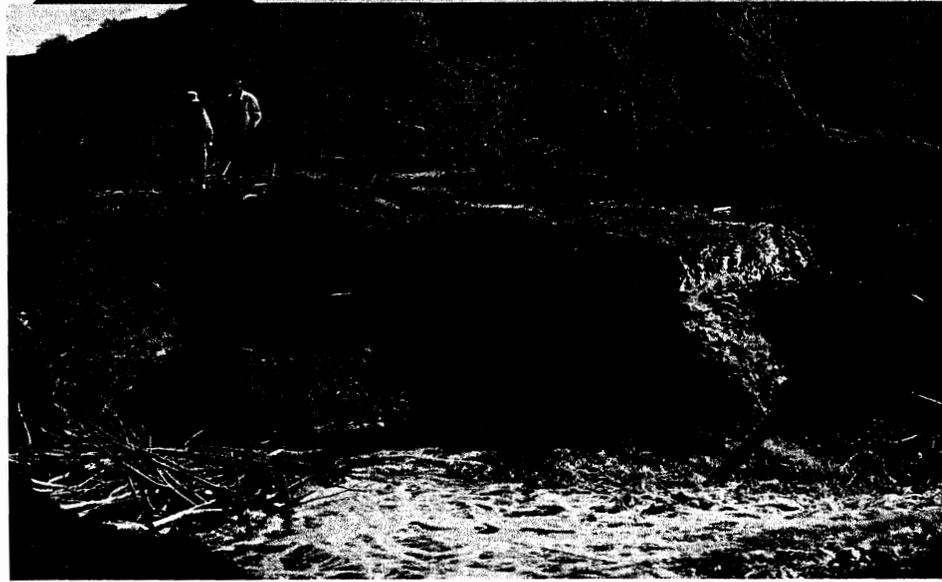
Improper grazing of upland vegetation can expose soils to erosive impact of rain drops, reduce water infiltration, and accelerate runoff. This can erode topsoil, and cut rills and gullies, concentrating runoff, deepening gullies, lowering water tables, and increasing sediment production.

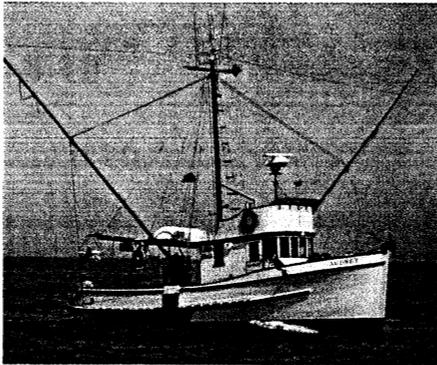
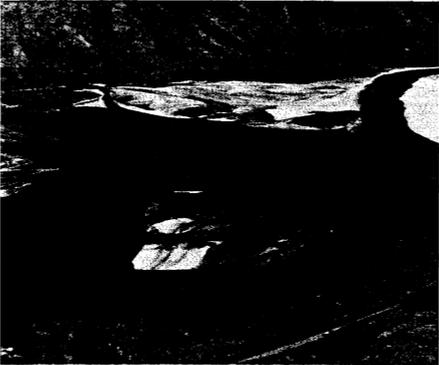
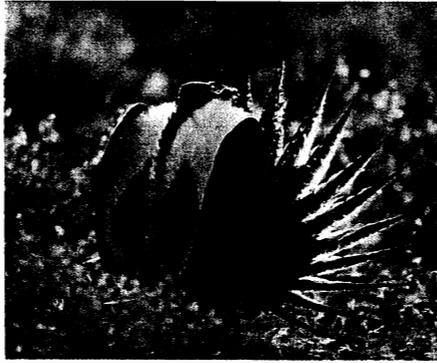
Riparian areas in poor condition are unable to buffer the effects of accelerated runoff. Stream channels downcut or erode laterally, accelerating erosion and sediment production.

The adverse effects of improperly grazed uplands and riparian areas accumulate and flow downhill. As the people affected become aware of the source of their problem, they naturally demand corrective laws and regulations requiring changes in grazing practices.



"He is the greatest patriot who stops the most gullies."
—Patrick Henry





Upland gamebirds such as sage grouse, are seasonally heavily dependant upon riparian/wetland areas. Degraded riparian areas and water quality which adversely affect migratory fish and wildlife can have adverse economic impacts thousands of miles away. The economic life of hydroelectric and water supply reservoirs can be significantly shortened by sediment from overgrazed uplands and riparian areas.

It's the Law

The Clean Water Act requires states to identify nonpoint sources of water pollution and develop procedures - Best Management Practices - to attain and maintain designated beneficial uses of water such as drinking water, agricultural water supplies, and fish and wildlife.

States are required to monitor water quality indicators such as sediment load, temperature, dissolved oxygen, and fish populations - all of which can be directly affected by grazing practices.

The Clean Water Act is only one of many laws requiring change in the way watersheds and their riparian areas are grazed by livestock. A variety of other laws apply to publicly-owned rangelands managed by the Forest Service and Bureau of Land Management. There is increasing public debate over state laws to govern agricultural practices, including grazing, that adversely affect watershed conditions.

Many areas of the West already are economically stressed by poor quality of water yielded from rangeland watersheds. Increasing urban populations will place ever greater demands on surface and groundwater, which in many areas are limited, shrinking, resources.

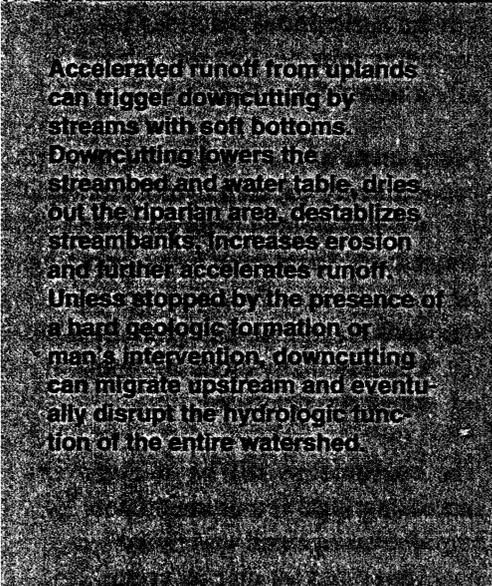
The smart money will be on ever increasing legal requirements for improved rangeland watershed conditions and for an ecosystem management perspective.



Improper grazing of upland vegetation increases the amount, and concentrates and increases the speed of overland runoff to streams. Doubling the speed of streamflow increases its erosive power by 4 times and its bedload and sediment carrying power by 64 times.



In streams with hard bottoms, accelerated runoff from uplands and degraded riparian conditions can result in destructive lateral erosion of streambanks and progressively wider and shallower stream channels.



Accelerated runoff from uplands can trigger downcutting by streams with soft bottoms. Downcutting lowers the streambed and water table, dries out the riparian area, destabilizes streambanks, increases erosion and further accelerates runoff. Unless stopped by the presence of a hard geologic formation or man's intervention, downcutting can migrate upstream and eventually disrupt the hydrologic function of the entire watershed.





Looking at Your Riparian Areas From a Water Quality Perspective

How can you tell if your riparian and wetland areas or watersheds are ailing and need treatment?

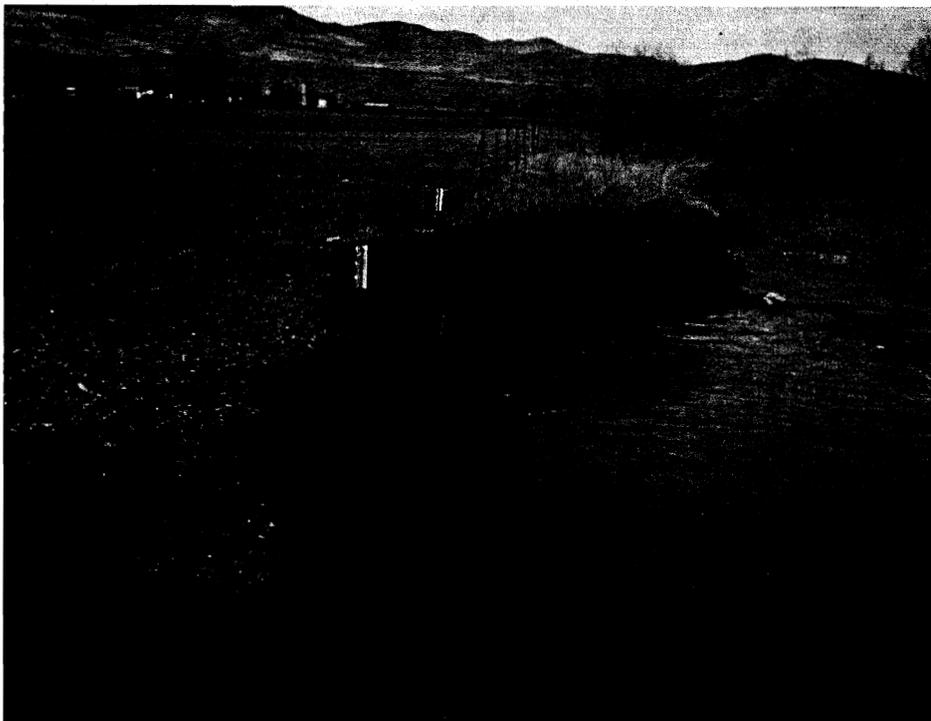
It's easy if you've got a wreck like the ones illustrated on this page. It might not be so easy if your circumstances are less drastic.

In fact, ranchers commonly respond to requests for improved riparian conditions with comments like, "But it's always looked this way."

That may be true from their perspectives. The present degraded condition of many western riparian areas and watersheds has its roots in uncontrolled grazing of the late nineteenth and early twentieth centuries.

It also could be that the deterioration has been so gradual, like kids growing up, that the change simply wasn't noticeable on a day-to-day, year-by-year basis.

The following pages illustrate and comment on some common symptoms of degraded rangeland riparian areas and watershed conditions.





Above Left This riparian area is about 7,000 feet in elevation. It has been summer grazed by sheep for 100 years. Looking at this stream strictly from a livestock perspective, you might ask, "What's wrong with this picture?" No raw, eroding streambanks or other obvious symptoms of degraded riparian conditions.

Above Right This is the same stream immediately downstream. This is what the whole stream should look like from a water quality/fisheries perspective. Narrower, deeper, cooler in summer and warmer in winter [deep snows bridge over the stream and insulate against winter temperatures which typically get down to -20 degrees F].



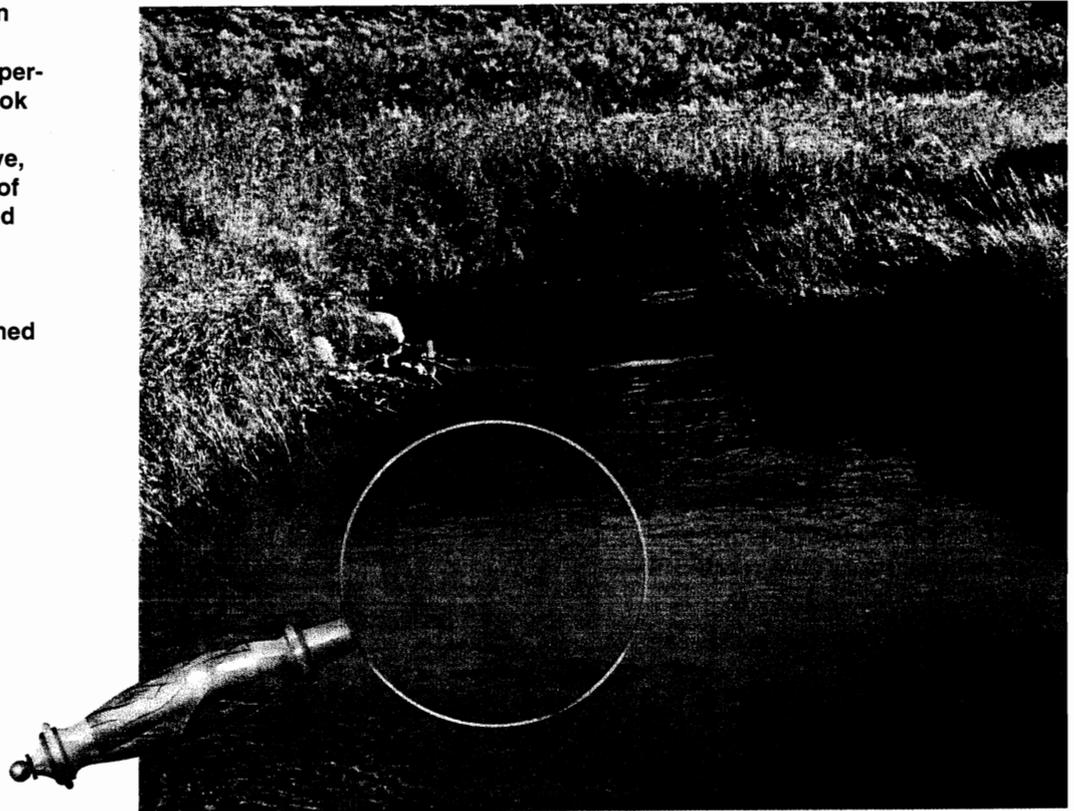
Above This stream flows through high-elevation irrigated pastures grazed by cattle mid-May through early October since the late 1800s. Woody vegetation was virtually eliminated; note remnant willows in background. Riparian vegetation mostly is a carpet of Kentucky bluegrass. The stream is wide, shallow and sediment laden. Fish and wildlife values and water quality are severely degraded.

It's obvious this stream and riparian area are degraded. They've been this way so long, it might not be obvious what the stream ought to and could look like under improved grazing management. The photo/illustration at right shows what the stream should look like from a water quality perspective.

The economic productivity and long-term value of the ranch have been significantly reduced.

Right Sixteen years of vegetation recovery stabilized badly eroded streambanks. From a livestock operator's perspective, things now look pretty good. A close look from a water quality/fisheries perspective, however, reveals large amounts of sediment, a symptom of degraded upstream watershed conditions.

Streams and their riparian areas must be looked at from a watershed perspective.



Streambanks trampled by livestock are a common feature of improperly grazed western riparian areas. Many livestock operators don't recognize this as a symptom of inadequate grazing management and a major contributor to degraded water quality.

Some people tout livestock trampling as a "tool" to lay back steep or undercut streambanks. The channel of a stream low in sediment could take decades to recover from being "laid back." It doesn't take much imagination to visualize the enormous damage that would result from applying this "treatment" to the streambanks in the photo below.



Trampling damage to streambanks may not be treatable by simply adjusting stocking rates.

Streambank vulnerability to trampling damage often is more related to soil type and how wet the soils are than to the number of livestock.

A small number of animals on easily erodable or wet streambanks can cause more damage than a large number on stable, frozen or dried out streambanks.

Successful riparian grazing strategies must include consideration of soil type and when streambanks are most vulnerable to trampling damage.

From a livestock operator's perspective, trampling and trailing damage is obvious in the photo above.

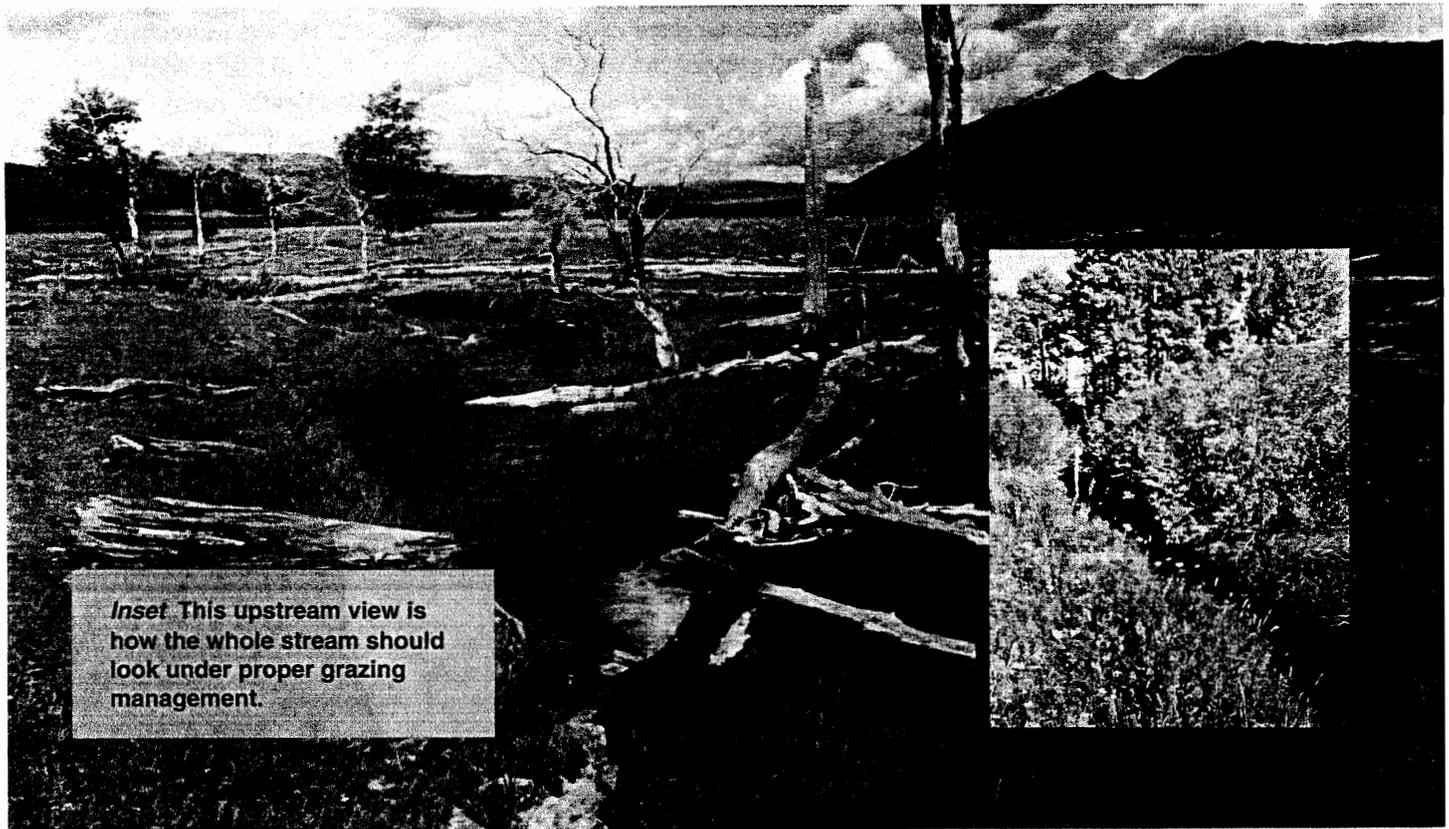
From a water quality/ecosystem perspective, it also is obvious that heavy summer use has eliminated aspens and is eliminating willows.

The channel is many times its natural width, is shallow, and sediment-laden.

There is virtually no shade or cover for fish, a key water quality indicator.

During high flows, raw streambanks produce large amounts of sediment which end up in the lake in the distance.

The landowner and his downstream neighbors all pay for improper grazing.

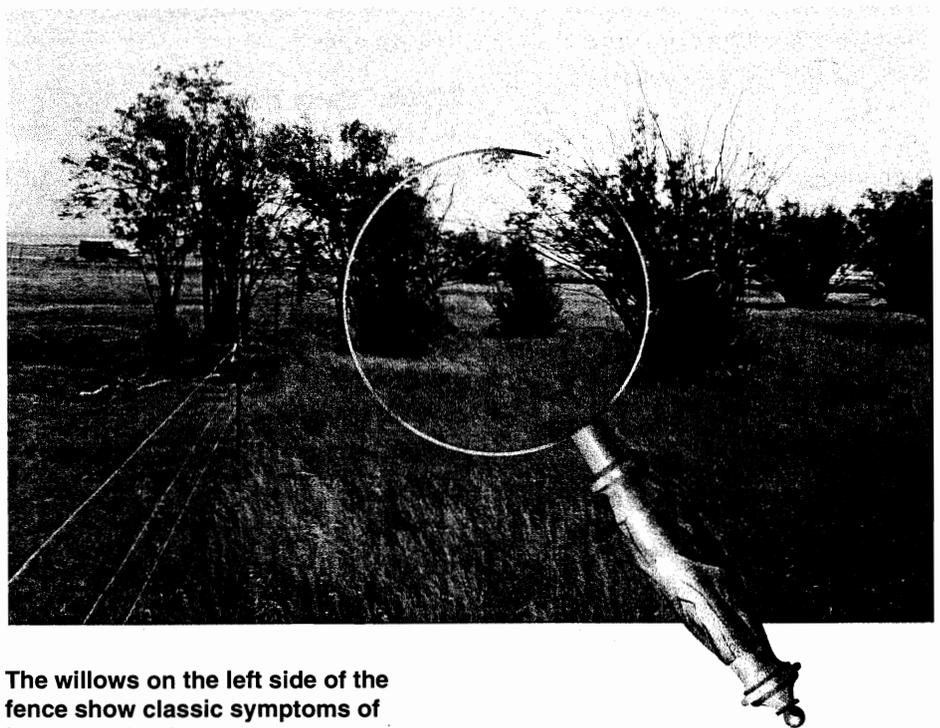


***Inset** This upstream view is how the whole stream should look under proper grazing management.*

Above From a livestock operator's perspective this stream might not look too bad. No raw, sloughing banks. Pasture looks rested during the latter part of the growing season, which gave grass a chance to produce foliage and store energy in roots.

From a riparian/water quality perspective, it is obvious that when upland forage matured and dried out, livestock concentrated on the thin line of green. Willows were eliminated. Aspen shoots were constantly browsed off and the parent trees eventually died of old age; soon aspen too will be gone.

Gravelly soils helped armor the stream channel against a hundred years of intense summer grazing pressure. Still, the stream is four or more times its natural width and one-fourth or less its natural depth. The water table has lowered and dried out the riparian area, now largely covered by a thin strip of Kentucky bluegrass. Livestock forage, fish habitat and the economic value of the ranch have been drastically reduced.



The willows on the left side of the fence show classic symptoms of improper riparian grazing. When upland forage matures and dries out, livestock naturally are attracted to riparian areas. When riparian grasses are depleted, cattle typically loaf around and browse willows, particularly the current year's growth. The willows right of the fence had been protected from livestock for one year.

Thinking Out A Riparian Improvement Grazing Strategy

The preceding pages briefly illustrate for livestock operators how to look at streams and riparian areas from a watershed/water quality perspective.

The following pages are designed to stimulate thinking about how to develop a grazing strategy customized to improve your particular riparian/wetland situation.

Yes, It Is Complicated

No one knows better than the people who move the stock that grazing western rangelands is a complicated business. The more one learns about livestock/ecological interrelationships, the more complicated it gets.

But "complicated" can't be allowed to get in the way of business, including the business of improving deteriorated riparian/wetland areas and water quality.

Getting Down to Basics

The kind and degree of riparian/wetland grazing problems vary all over the map.

There are a few simple common denominators which apply whether you're in the desert Southwest, Northern Great Plains, Northwest, or wherever.

- Livestock follow the green.
- Riparian vegetation typically is quite different than plants on adjacent uplands.

- Grazing strategies targeted exclusively on upland grasses can result in severe overgrazing of riparian grasses, forbs, shrubs and tree seedlings.

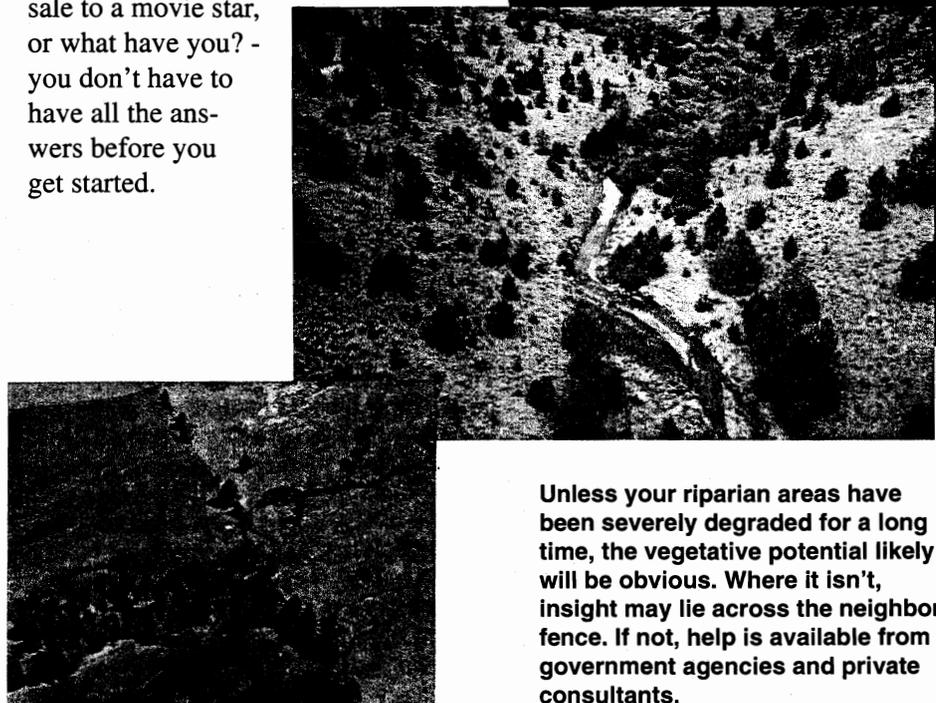
Wherever you are, whatever your particular riparian grazing problem, there are three basic ways to treat it.

From the least to the most complicated, they are:

- Exclude livestock from the riparian area with stream corridor fencing.
- Put riparian areas in separate pastures to get tight control over the season, duration and intensity of livestock use.
- Herd or use some other grazing strategy to limit the season, duration, and intensity of grazing on riparian areas.

Whatever your riparian improvement objective - improved water quality, pasture damage control, improved forage production, more fish and wildlife, making the place more attractive for future sale to a movie star, or what have you? - you don't have to have all the answers before you get started.

In most cases, the immediate objective should be modest: to get deteriorated riparian areas and streams started on an improving trend. Once that happens, changes in plants and streambanks usually will suggest common-sense next steps.



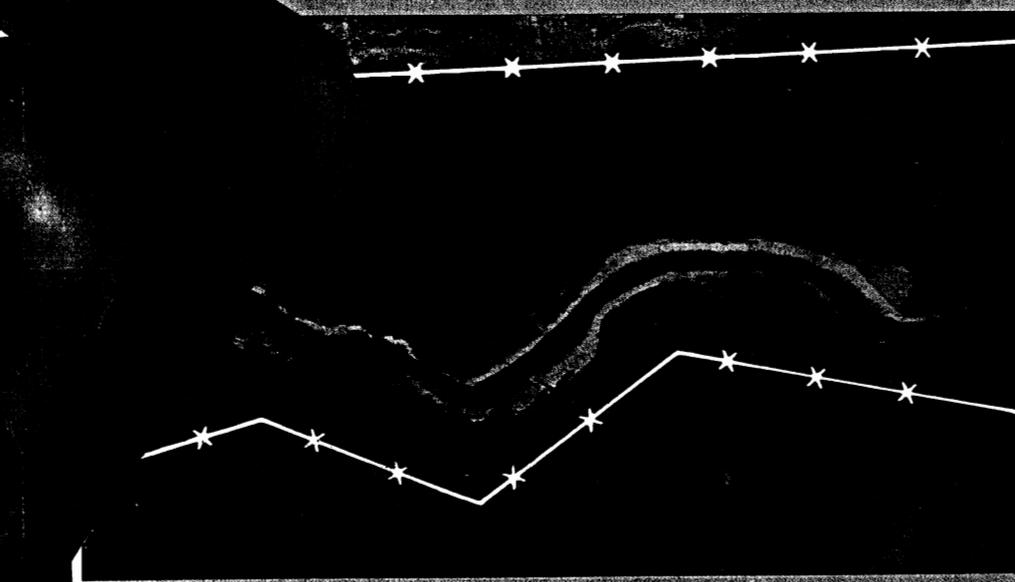
Unless your riparian areas have been severely degraded for a long time, the vegetative potential likely will be obvious. Where it isn't, insight may lie across the neighbor's fence. If not, help is available from government agencies and private consultants.



For decades, stream corridor fencing got a bad rap from many ranchers who believed the only good fence is perpendicular to flowing water.

However, once the decision to change grazing management has been made, operators frequently find fencing - to exclude livestock or to create riparian pastures - is one of the most cost-effective ways to control livestock use of degraded riparian areas and improve water quality. In some cases, it is the only practical way.

Operators should resist the urge to put enclosure fences on the high water line. Enclosures need to include enough of the riparian area to restore riparian and stream functions, and to give the stream channel some room to move over time.



Riparian pastures take a variety of shapes and sizes. In wide stream valleys they include the stream and all or part of the riparian area targeted for special management. Riparian pastures should be large enough to provide management flexibility, and obviously should have special management criteria for key plants and streambanks.

In steep, narrow valleys, riparian pastures may include a large portion of uplands. The needs of riparian vegetation and condition of stream banks dictate grazing management for the whole pasture.



In canyon country, short stretches of gap fence are a relatively low cost way to control livestock use of many miles of riparian area. By blocking livestock from steep terrain, operators often get substantial secondary benefits of improved ease of gathering and better utilization of upland forage.



It's a seductive idea to "fix" an ailing stream with structures rather than go through the hassle of changing grazing management. This can be risky, expensive business.

It's important to keep in mind that instream structures only treat symptoms of the problem. They typically are high-cost and have high probability of failure; streams have an exasperating habit of slipping the best-designed collars. When they do, the investment in structures is wasted, and the symptoms they were designed to treat may actually be worsened.

Instream structures such as gabions, rock or log weirs, and riprap may be necessary to treat serious streambank erosion, to stabilize a runaway stream channel, or trap excessive sediment. They should be employed with care and along with changes in grazing management necessary to treat the underlying problem of deteriorated watershed conditions.

Top This stream channel was destabilized by poor watershed conditions. Massive, expensive, rock gabions were installed to slow flows, reduce energy, and catch sediment. Grazing management wasn't changed. The stream eventually made an end run to the left. The gabion now deflects the current's erosive force into the streambank. Result: a lot of money and more streambank down the drain.

Bottom Log weirs are popular stream "training" devices frequently substituted for improved land management. The log weirs in the background washed out. The stream dug under the logs in the foreground.



If rangeland watersheds are overstocked they will be overgrazed and their long-term productivity will deteriorate, no matter how well you otherwise manage your livestock.

If you under-manage your livestock, rangeland riparian areas probably will be overgrazed, no matter how understocked you are.

From a riparian/water quality perspective, how many head often is less important than where, when, and for how long.

Livestock tend to concentrate in and overuse riparian areas at certain times of the year.

If you treat your riparian/wetland problem with anything other than a stream corridor enclosure, things can quickly get complicated. They

get modestly more complicated if you go to riparian pastures with special management criteria. They get much more complicated when you have to simultaneously juggle livestock and the needs of both riparian and upland vegetation.

Any successful riparian grazing strategy will at minimum:

- Limit grazing intensity and season of use to provide sufficient rest to encourage plant vigor, regrowth, and energy storage;
- Ensure sufficient vegetation during periods of high flow to protect streambanks, dissipate stream energy, and trap sediments;
- Control the timing of grazing to prevent damage to streambanks when they are most vulnerable to trampling.

The basic building blocks of such a strategy can be derived by answering a few simple questions such as:

- Which plants will grow and reproduce on each site? Which plants do you want to encourage; when do they put on new growth, produce shoots or seeds, store energy, become dormant?
- When livestock are in the riparian area, what plants do they prefer at different times of the year?
- When livestock are not in the riparian area, where are they, and what plants do they prefer?
- When livestock are in the riparian area, are they under-utilizing upland vegetation?
- What time(s) of the year are streambanks and riparian areas under most stress from high flows?
- When are streambanks most vulnerable to damage by livestock trampling?

The answers to these basic questions will get your thought process going, and help narrow options to those most likely to help you achieve your specific riparian improvement objectives.



This area is within a 17,000-acre single pasture. The top photo was taken in 1979. Up to that time the pasture had been grazed by 1000 herded sheep, mostly in the late winter and early spring. In 1981, 40 pairs of cows were added June-August. The bottom photo taken in 1990 shows the results just eight years later. *Bottom line* this riparian area and stream were not degraded because the pasture was overstocked, but because the livestock were under-managed and the riparian area was not considered in the new season of use.

The next few pages summarize the likely response of riparian areas in poor condition to some commonly used grazing strategies.

Repeat: These are *generalized* responses of *degraded* riparian areas, under *typical* management.

A good manager can make almost any grazing strategy work. A poor manager can make almost any grazing strategy fail.

The following examples provide perspective that may be useful in thinking through the characteristics of a grazing strategy to treat your ailing riparian areas.

Continuous Season-Long Grazing

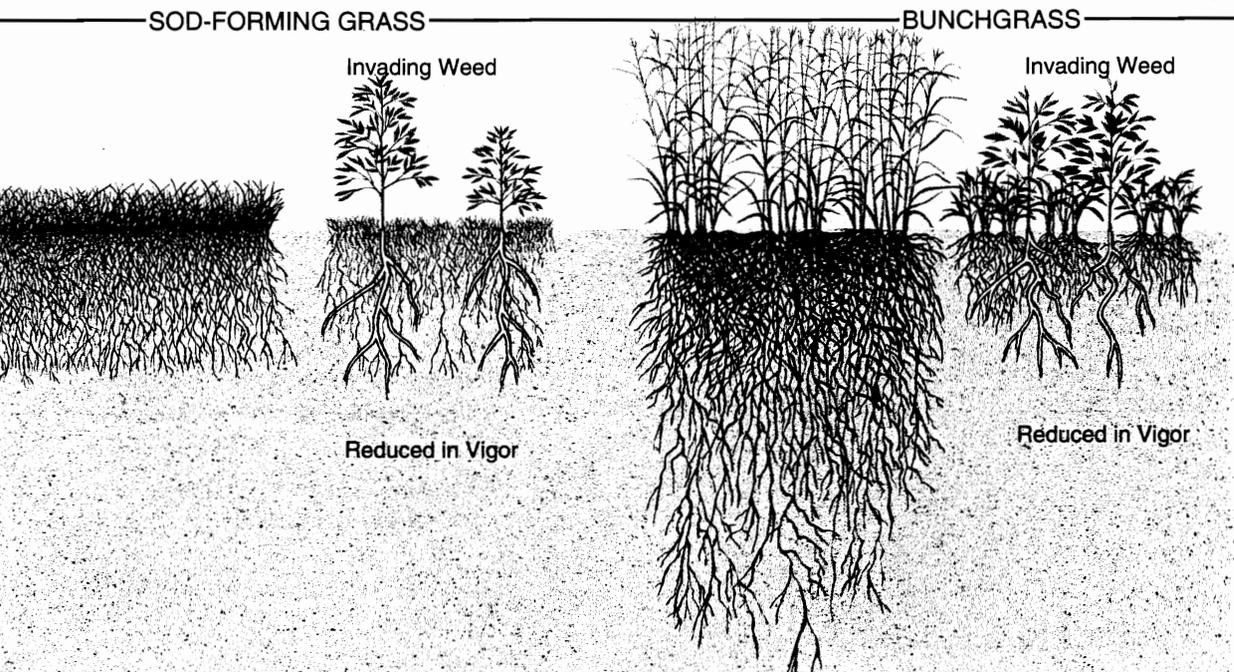
Graze through the growing season and into fall every year. Hands-off, free-will grazing. The Columbus Method; turn 'em out in the spring and come back and discover 'em in the fall.

Upland and riparian plants get no rest for regrowth of foliage or for root production and energy storage. Seed may or may not be produced.

When upland vegetation dries out, livestock are attracted to riparian areas. Riparian grasses, forbs, and new growth on shrubs and trees may be severely overgrazed.

Under typical stocking rates, there is little to no chance of turning around deteriorated riparian areas with continuous season-long grazing. This applies to northern areas dominated by cool season grasses and southern areas dominated by warm season species.

Indeed, this is the kind of grazing that severely damaged rangeland watersheds throughout the West. Much of this damage will take generations of good livestock management to repair.



Effects of overgrazing on root production, plant vigor and species composition.

When plants are severely grazed, root growth stops. Regrowth of foliage takes precedence over providing energy for root growth. Repeated severe grazing causes roots to die back, reducing plant vigor. Plants then produce less livestock forage, are more susceptible to low soil moisture, and may be replaced by plants less palatable to livestock and less

useful to protect upland watershed conditions and riparian areas.

Grazing strategies which properly prune foliage and give plants sufficient rest for regrowth and energy storage, will produce more livestock forage over the long term than continuous grazing during the growing season.

Cool season grasses grow in the spring, mature by late spring or early summer, become dormant during hot summer months, resume growth in the fall, become dormant with cold temperatures. Warm season grasses grow in late spring and summer and become dormant in late summer and fall.

Winter Grazing

The flip side of continuous season-long grazing. Graze when plants are dormant. Provides total growing season rest. Promotes plant vigor, seed and root production.

Generally beneficial to riparian conditions if livestock are watered or are fed elsewhere, or if cold air drainage discourages livestock from congregating in riparian areas.

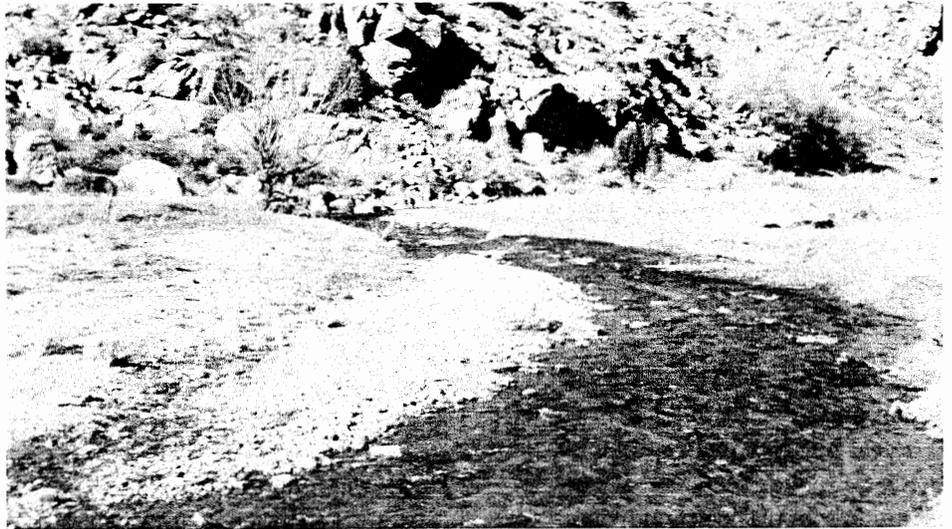
Otherwise, keep eye out for trampling damage to unfrozen, wet streambanks and potential overuse of previous season's growth on shrubs and trees.

Generally an excellent strategy for recovery of deteriorated uplands and riparian areas.

Spring/Summer Grazing

Graze early spring through summer plant growth periods every year.

Riparian effects similar to continuous season-long grazing. Cool season plant communities can be severely overgrazed early and during summer seed production; fall precipitation might allow some regrowth and energy storage for the following year's early foliage production and for bank protection.



Warm season plant communities are grazed throughout growing season with little time for recovery. This usually results in severe negative impact on riparian trees and shrubs. Potential for trampling damage of wet soils during spring runoff and summer thunderstorms. Typically does not provide sufficient vegetation to armor streambanks against runoff from snowmelt and thunderstorms.

Potential for riparian area damage can be reduced with good management to closely control season, duration, and intensity of riparian grazing. Otherwise, odds are against this grazing strategy allowing recovery of degraded riparian areas.

Top Result of season-long grazing on a Colorado pasture.

Bottom Results of nine years of grazing restricted to November through February.

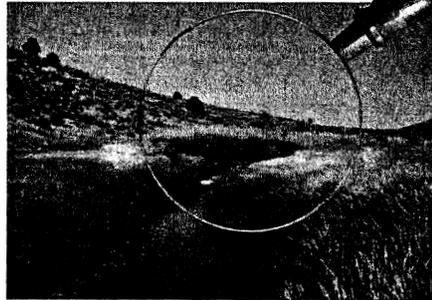
Three-Pasture Rest-Rotation Grazing

This is one of the most popular generic rangeland grazing strategies. Typically provides for grazing a pasture in spring the first year, summer the second, and no grazing the third year.

Basic theory is that you graze cool season grasses early and heavy the first year but give them summer to recover, produce seed, and store energy in roots. The second year they are rested until after seed ripe, then grazed. Rested third year.

Warm season grasses are grazed lightly early the first year, heavy the summer of the second year, with total rest the third year.

With attention to the degree of plant utilization, this grazing strategy has produced good results for upland grasses.



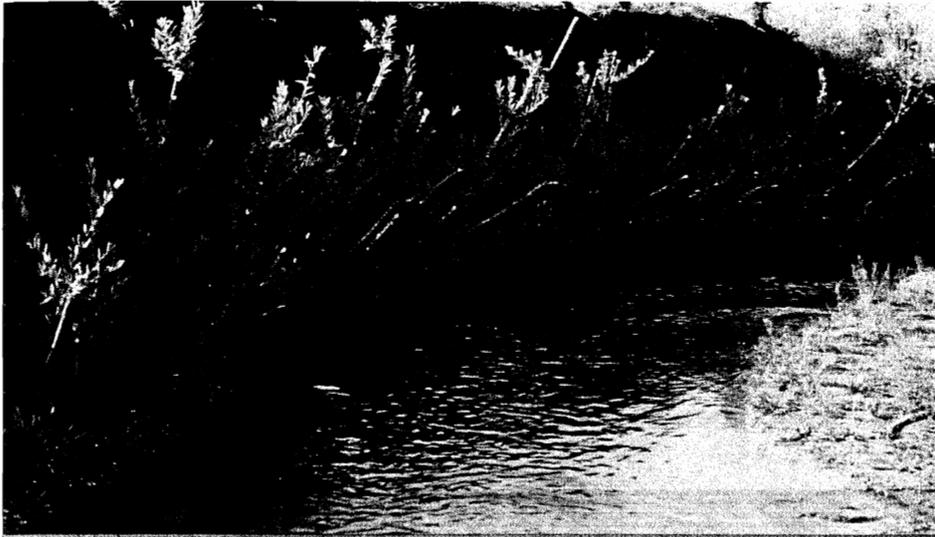
A full year's rest the third year allows cool and warm season grasses to build root reserves and litter.

As generally practiced, this strategy is good for sedge-rush-grass communities. It often is detrimental to riparian tree seedlings and brushy species, especially willows. Livestock can consume two or three years growth in one summer grazing period.

Close attention to woody species utilization generally is necessary for this grazing strategy to improve condition of brushy riparian vegetation.

These two streams are within the same public land grazing allotment grazed by the same operator, with the same cows, under the same three pasture rest-rotation grazing strategy, with the same goal of improving riparian conditions.

The photos on the left show the streams in 1976, those on the right in 1986. The good condition stream and riparian area in the top photos responded well to this grazing strategy. Sedges and rushes prospered and the water table raised (note the resulting increase in grasses and decrease in sagebrush on the small knoll in the center middleground of photo). The poor condition stream and riparian area in the bottom photos continued to deteriorate. Note the reduction in willows in the bottom photos.



Generations of livestock operators throughout the West have waged war on riparian willows, often with government help. In some cases, the result may have been a short-term increase in grasses. In many cases, the result was riparian areas and streams falling apart and more government help to put them back together again. Frequently the most effective technique is - you guessed it - replanting willows and/or changing to a grazing strategy that favors willow.

Above Willows typically establish on point bars like the one extending into the photo from the right. Here willow cuttings were planted deep into the opposite cutbank so roots would anchor soils and vegetation would slow and reduce the erosive force of spring runoff.

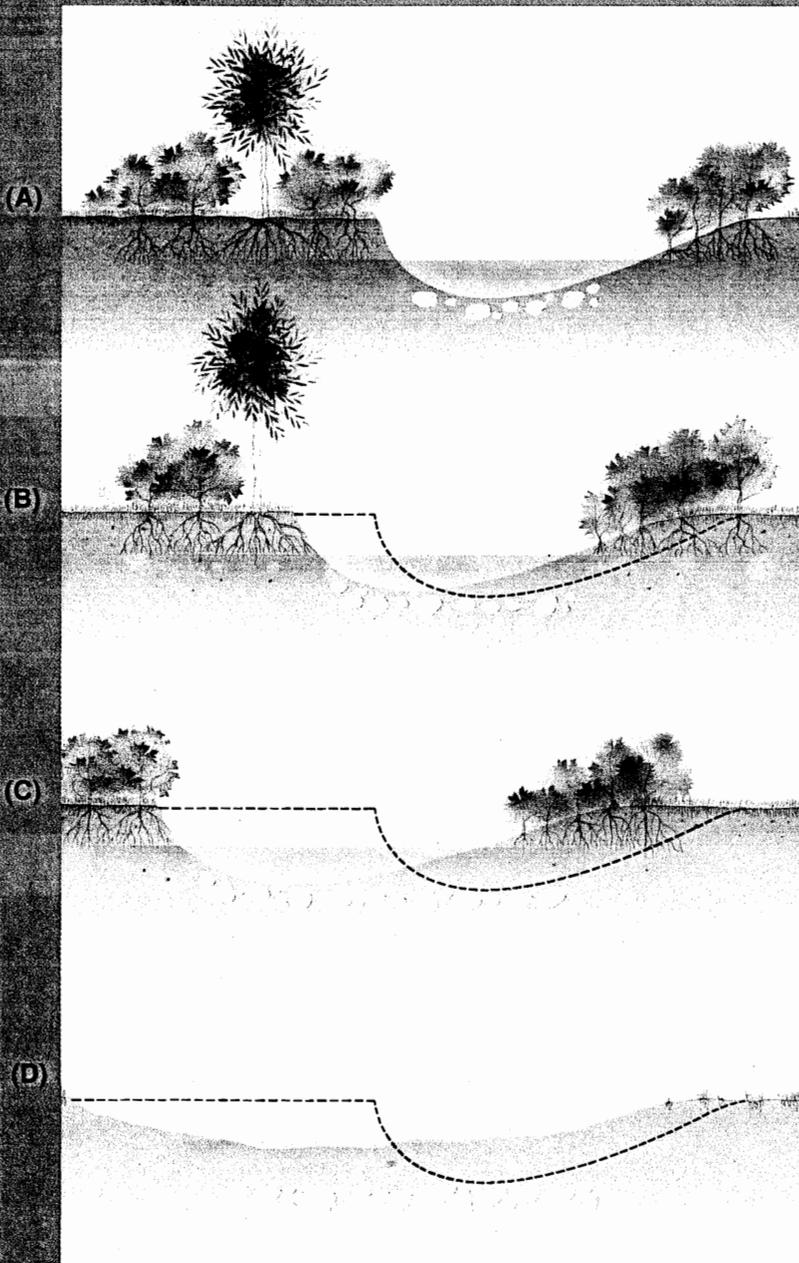
GENERALIZED MECHANICS OF LATERAL STREAM CHANNEL MIGRATION & ROLE OF WILLOWS

(A) With good watershed/riparian conditions, vigorous, diverse riparian vegetation resists lateral channel movement.

(B) When the stream does erode the left bank, sediment is deposited on the right and willows establish on the deposit.

(C) Willows slow high flows and trap sediment. As the point bar builds up and the soil dries out, willows eventually are replaced by sedges, grasses and other meadow plants.

(D) Without the streambank stabilizing and soil building role of willows, the stream channel would have greatly widened and shallowed, and lowered the water table. Meadow plants would have been replaced by sagebrush or other plants less desirable as livestock forage.



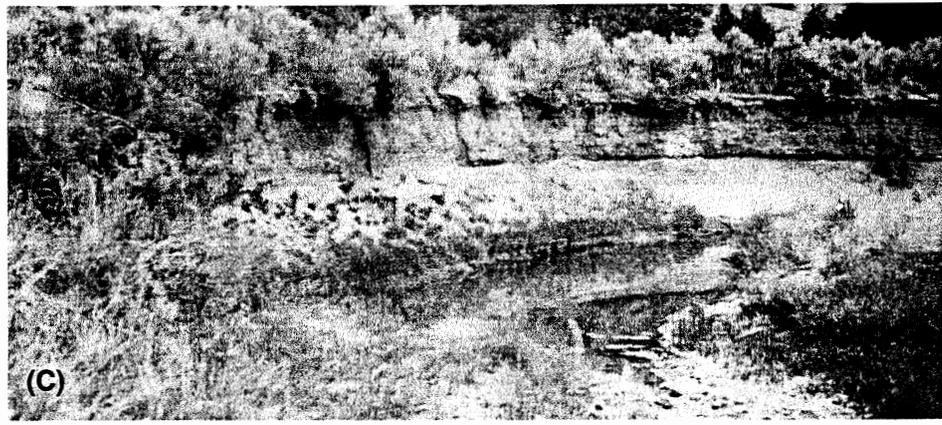
Early Grazing

Graze early during the grass growing season; early spring in cool season areas, early summer in warm season areas.

This strategy usually results in good dispersal of cattle and minimizes use of riparian woody plants. Provides herbaceous plants rest during most of the critical late growing period which promotes plant vigor, seed production and energy storage in roots.

Caution: early foliage growth is from root reserves; heavy grazing every year at this time can seriously damage preferred plants.

This strategy has potential to improve riparian woody vegetation. Utilization of grasses must be carefully controlled. In many areas, wet streambanks may be susceptible to trampling damage under this grazing strategy; potential may be minimized due to good dispersal of cattle.



(A) Photo taken in 1978 after years of continuous summer grazing.

(B) Photo taken in 1984 after grazing was changed to early spring only. No reduction in AUMs.

(C) Livestock grazed season-long prior to this 1976 photo.

(D) Grazing was changed to late winter-early spring (February-April). Riparian vegetation was allowed to regrow to protect streambanks from high runoff from summer thunderstorms and snowmelt following year. Juniper was thinned on adjacent hillsides. **Results** By 1986, a 400% increase in AUMs, restored riparian area, improved water quality, restored trout population.



Two - Pasture Rotation Grazing

First year graze during grass growing season [spring for cool season species; late spring-summer for warm season species]. Second year graze after seed ripe [summer for cool season species; late summer-early fall for warm season].

Provides total growing season rest for grass every other year. Spring grazing may help ailing riparian woody vegetation [see Early Grazing]. Summer and fall grazing potentially harmful to riparian shrubs and tree seedlings.

Under proper management, this grazing strategy may maintain or improve low gradient grass/sedge riparian areas, but usually is detrimental to reestablishment of woody vegetation.

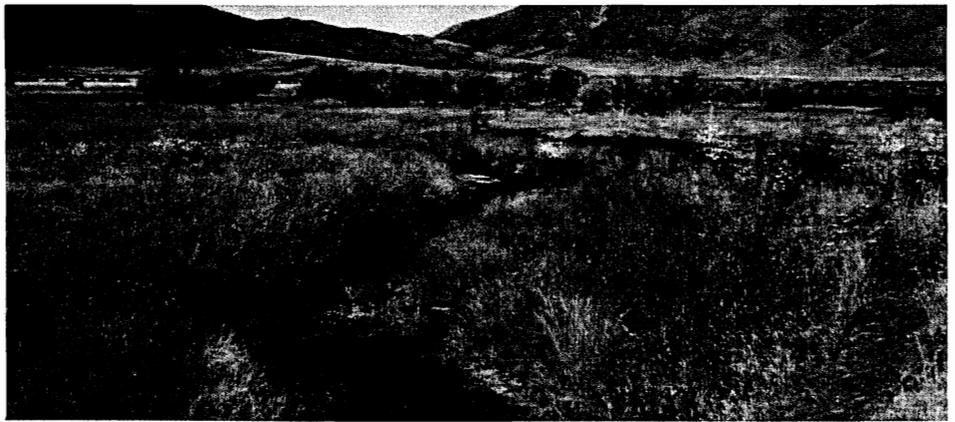
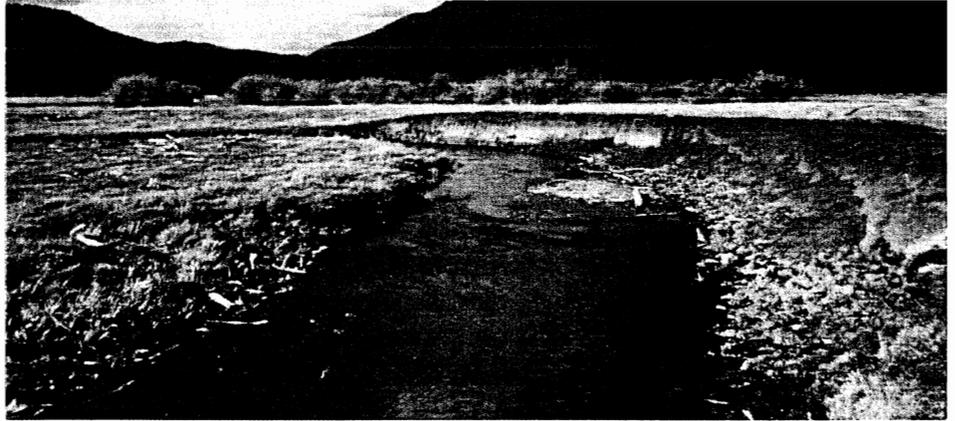
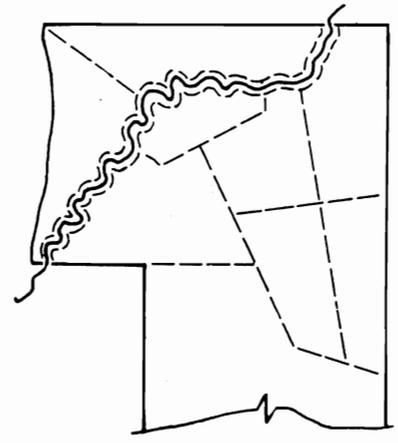
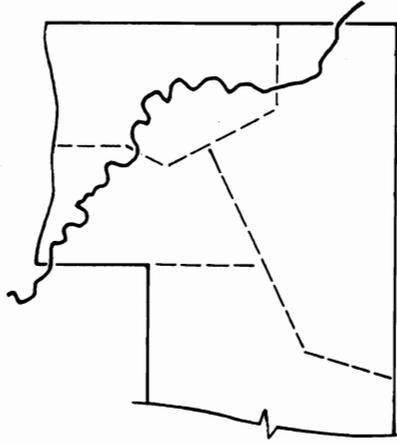
Riparian Exclosures/Irrigated Pastures

Repairing damaged riparian areas within intensively managed irrigated pastures presents a special management challenge.

High animal density in a confined space usually requires putting the riparian area in a separate pasture with special management standards, or excluding livestock from the riparian area.

The stream in the photos to the right runs through irrigated pasture intensively grazed June-October. Trees and shrubs had been virtually eliminated. Streambanks were raw, actively eroding at high flows, and contributing large amounts of sediment to downstream neighbors.

After analyzing all his options, the rancher concluded stream corridor fencing to exclude livestock was the only way to restore and protect the riparian area and water quality while still intensively grazing adjacent pastures.



The corridor fence was integrated into a new system of pastures which were increased from four to nine. This allowed the rancher to better manage and increase livestock forage while improving water quality, trout production, and the aesthetic and future economic value of the ranch.

Top Results of a century of season-long (June-October) continuous grazing.

Bottom Results after excluding livestock for five years.

The preceding pages summarize likely responses of poor condition riparian areas to some commonly used grazing strategies.

These very generalized snapshots are only for insight, to help narrow options and stimulate thinking about a grazing strategy custom-designed to treat your ailing riparian areas. Some common sense observations:

- Each watershed, stream, stream reach, and riparian area has unique characteristics that must be accounted for in developing a grazing strategy to improve degraded riparian conditions and water quality.

- No one grazing strategy fits all conditions. Any off-the-shelf grazing strategy likely will have to be modified to fit your specific conditions, and updated as conditions change.

- A grazing strategy is only as good as the management that goes into it. A high level of management can make almost any grazing strategy work. A low level can make almost any strategy fail.

- Riparian exclosures and riparian pastures reduce management complexity and enhance the odds and speed of achieving riparian improvement objectives.

- When grazing riparian areas within upland pastures, one or more of the following management techniques probably will have to be added to your grazing strategy to improve degraded riparian areas:

—Provide water, salt, supplemental feeding away from riparian areas;

—Herd to limit livestock use of riparian areas;

—Add more pastures to increase management flexibility and increase rest for riparian areas.

Utilization Standards

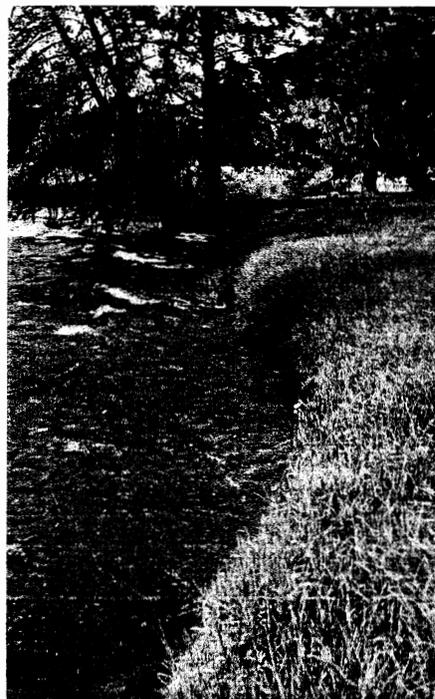
Grazing strategies generally are thought of in terms of time and place of grazing. You obviously also have to carefully control the amount of grazing on riparian vegetation you want to encourage.

Utilization standards are important. However, you have to be careful when using off-the-shelf utilization standards such as, take half and leave half, and four-to-six-inch residual stubble height.

These common standards may be inappropriate for some *degraded* riparian plant communities. Each situation must be independently evaluated. Trial and error may be required. Standards probably will have to be changed as vegetation responds.

Where privately owned streambanks and/or riparian vegetation are severely degraded, to start it may be best to simply decide what you want your degraded riparian areas to look like, and make common sense changes in grazing management in that direction.

Eventually, it will be necessary for good management to set and consistently meet specific utilization standards for the riparian vegetation and streambank conditions you want to encourage.



Top Sod-forming sedges provide excellent streambank protection and sediment collection. In one study, a four-inch cube of sod contained more than a mile of fine roots.

Bottom This sedge stand provided a protective blanket against spring ice flows that could have caused serious streambank damage if vegetation had been grazed to four- to six-inch stubble height immediately before or after plant dormancy.



These photos show the effects of similar utilization standards on two different types of streams under carefully controlled research conditions.

Prior to any cattle grazing, the sandy loam streambanks in the top photo were stable, well protected by grass, and contributed little sediment to the stream during high runoff. Over time, taking half and leaving half - even under carefully controlled conditions - broke down fragile streambanks and exposed soils to the erosive force of spring high flows. Note heavy sediment load in stream.



The soils in the riparian area in the bottom photo are more gravelly, better drained, and generally tougher than those in the photo above. Riparian grasses left of the fence were grazed by cattle to meet a 60% utilization standard. Result over time: no significant damage to streambanks. Compare to ungrazed area right of the fence which was excluded from grazing. Note relatively sediment-free stream bottom.



In the top photo, taking half and leaving half didn't overgraze riparian grasses, but did "overgraze" streambanks. In the bottom photo, a higher utilization rate didn't damage plants or streambanks.

Stream character - not the forage utilization rate - determined the effect of livestock grazing on the riparian area and on water quality.

Monitoring Results

Results count.

It's important to monitor the effects of changes in grazing management. To check progress toward long-term objectives on a continuing basis.

It's easy to tell if big things are happening fast. Some sites will be slow to recover. Some responses important from a water quality perspective will be gradual and only become obvious over time.

Ranchers typically keep detailed records on animal performance from year to year.

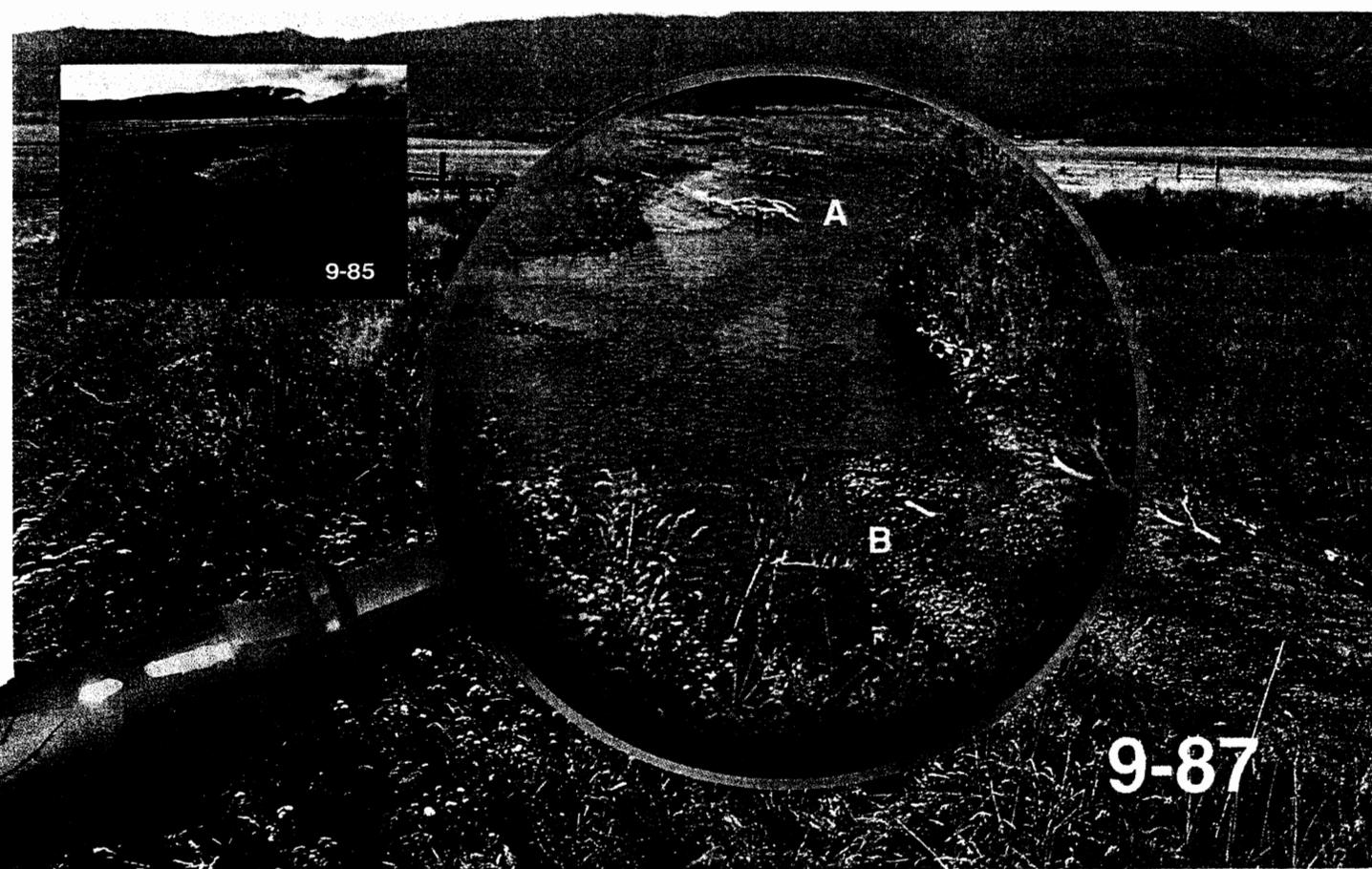
It's no great leap - and a lot easier - to record how key plant species, the overall riparian area and stream, and key upland plants respond to changes in grazing management.

As with many things, the simplest way also is the best way - annual photographs of the same representative areas.

Establish a few photo points - easily accessible, easily recognizable, permanent landmarks - from which to shoot each year's photos.

Supplement the photo album with notes on your observations of the condition and trend of riparian vegetation, streambanks and stream channel. Don't forget to do the same for key upland sites.

Over time, this record will clearly reveal progress - or lack of it - toward long-term objectives that may not be readily apparent at any given point in time.



The vegetative response in this riparian area was immediate and obvious to a livestock operator basically in the business of harvesting plants. Other important responses might not be so obvious from a livestock perspective.

(A) Vegetation filtering out sediment, building streambanks, and narrowing and deepening the stream channel.

(B) Reduced fine sediments in streambed gravels - an important indicator of improving water quality conditions and improving trout spawning habitat.

Some degraded riparian areas may be quickly restored to former productivity. Others will take generations of improved grazing management.

A photographic record is essential for your successors to see progress - or lack of it - toward long-term objectives.

The photos on this page document a half-century of slow but steady response of this riparian area to slow but steady changes in grazing management.

Top Northern Great Basin stream under heavy grazing about 1935.



Middle Same spot in 1947 under light grazing.



Bottom Same area in 1986 under very light grazing. The formerly downcut stream channel has built up bringing the water table with it. The point bars now are about level with the opposite banks.



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The preceding pages are designed to stimulate thinking about how to change grazing management to improve degraded riparian areas and water quality.

Just looking at your riparian areas from a water quality perspective may suggest a relatively easy answer to your particular problem. It may be as simple as adding a cross fence to get your riparian areas into a separate pasture and under special management.

In many areas it will be much more complicated. For example, high elevation pastures where the grazing and growing seasons are short; allotments with several pastures and streams of different types, in different condition and trend, and in mixed ownership.

No one said it was going to be easy to change the way we have managed grazing on western riparian areas for more than a century. Only that change is necessary and inevitable.

Over the past decade we've learned more about riparian/wetland values, and about the effects of livestock grazing on western rangeland watersheds, than we learned the previous century.

This knowledge has fundamentally changed the way land and livestock managers and society as a whole think about rangeland grazing in general, and its effects on limited, high value riparian/wetland areas in particular.

But it will take more than just thinking about it to restore and sustain the many public and private benefits from productive western rangeland watersheds.

It requires large, long-term investments in improved management and in infrastructure such as fencing, alternative water supplies, and other improvements.

It requires more than a new investment strategy. It requires leadership by the livestock industry. It requires a spirit of cooperation and a public/private partnership. It requires a watershed and ecosystem perspective.

Most of all, it requires a can-do attitude and creative thinking by the men and women who move the livestock.

When it gets right down to it, they are the most important people in the growing national effort to improve water quality and the long-term economic productivity and quality of life on western rangeland watersheds.



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Getting Help to Manage Change

This document is designed to help the men and women who move the livestock look at their riparian/wetland areas and streams from a watershed/water quality perspective, to stimulate their thinking about how to change livestock management to improve deteriorated riparian areas and water quality.

In short, to help them get out in front of and manage the necessary and inevitable changes in the way deteriorated western rangeland watersheds in general, and riparian/wetland areas in particular, are grazed.

The document doesn't, of course, attempt to prescribe or design site-specific grazing strategies, tell how to determine the carrying capacity of or set forage management objectives for a pasture, understand vegetative succession or stream hydrology, balance riparian and upland management, keep grazing records, dose a calf, mend fence, or balance a checkbook, all of which and more are essential to good management.

There is a wealth of technical information and professional help available to livestock operators. Until fairly recent times, there hasn't been much call for expertise in managing livestock grazing on western riparian/wetland areas. But that too is changing rapidly.

Today, ranchers with a positive attitude toward changing their operations to benefit watershed/water quality conditions can find good, mostly free, help.

Places to look for it include the Soil Conservation Service, Extension Service, Bureau of Land Management and Forest Service [now's a good time for permittees to start thinking of federal land managers as watershed partners].

Non-traditional sources of useful expertise for the livestock industry include people within state and federal fish and wildlife agencies. Also, there is a small but growing number of private consultants who understand both livestock grazing and watershed/water quality issues.

Outside professional help can be an invaluable complement to ranchers' on-the-ground knowledge.

In the final analysis, however, the quality of water and other values produced on western rangeland watersheds depends most on the business-like creative thinking, watershed perspective, good citizenship, and can-do-attitude of the men and women who move the livestock.

CREDITS

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