LESSONS LEARNED CONCERNING LIVESTOCK IN RIPARIAN ZONES AND THE ASSOCIATED UPLANDS OF RANGELAND WATERSHEDS

John C. Buckhouse

INTRODUCTION

The western United States has experienced a wide range of uses and impacts in the 150± years since the arrival of Europeans. Beaver trapping by the Hudson Bay Company and the American Free Trappers removed tens of thousands of beaver from the Intermountain and Pacific Northwest. With the loss of the beaver, subsequent washing out of dams and downcutting of valley bottoms, a path of destruction was initiated. Drovers arrived on the heals of the trappers with cattle, sheep, and horses. Closely following the livestock owners were homesteaders who enthusiastically plowed and grazed many fragile landscapes that were never ecologically suited for intensive use.

This early pattern of exploitive use of rangeland ecosystems caused numerous instances of retrogression in plant communities, soil stability, erosion, and watershed function. Fortunately, recent decades of research, thoughtful observation, and intensive management has redirected many ecological trends into positive directions. While all members of society would probably agree that there is still a distance to go, the observant individual can be heartened by the generally positive trend that the nation's rangeland watersheds are experiencing. Nevertheless, there are places where long-lived, invading or encroaching species are proliferating and cause for alarm is present.

In this paper, I will explore a number of opportunities where management can make a positive impact on the ecological, social, and economic realities of rangeland ecosystems.

NEGATIVE AND POSITIVE IMPACTS OF GRAZING

Negative

Herbivores, be they livestock or big game, in numbers exceeding carrying capacity, at times of the year when plant growth and physiology are most critical; or if their distribution patterns encourage congregation on critical sites, can be deleterious to those sites. History is replete with examples of streambank sloughing, dietary overlap and competition, nutrient loading, vegetation species composition changes, erosion, and pollution which was traced to herbivore excesses of one form or another.

Positive

Fortunately, as we have learned more about the ecological pieces in this managerial puzzle, it becomes apparent that management by objective and for sustainability is not only possible, but achievable. Here are a few examples.

Positive changes in species composition and community structure

Herbivores, particularly livestock, can be used as a biological tool to encourage succession. If, for instance, a site is heavily infested with invading annuals and/or noxious alien weeds, it may be possible to prescription graze the site at a time when the aliens are vulnerable in order to encourage the growth of remnant, native perennials.

By doing prescription grazing one can foster individual plant response, tillering, seed production, seedling establishment, and vegetation cover in order to enhance infiltration of precipitation at the point of origin. This in turn fosters soil moisture and nutrient cycling relationships

Wildlife habitat

A common perception among many people is that livestock and wildlife are in direct competition with each other for food and/or habitat. At abusive grazing levels this may indeed be true. At managed levels, however, quite the opposite is so. Following the lead of African researchers in the Serengeti, who established the interdependence of feeding guilds, rangeland managers are learning how to use "coarse" feeders such as cattle to foster forage and habitat for more "delicate" feeders such as elk or geese. In Oregon, and elsewhere in the West, cattle are used to "prepare" sites for wildlife. Without the coarse feeders, vegetation would be less succulent and palatable for the next guild. The ODFW elk pastures on the South Santiam and the migratory geese feeding stations in the Willamette Valley are good examples of where livestock have been used in conjunction with positive uses.

AMELIORATIONS

In riparian zones, particularly, concerns about improper grazing by livestock have created conflicts between and among natural resource groups. There are several opportunities for management that can enable the positive ecological and economic values of livestock production to be compatible with watershed, habitat, and wildlife values.

Livestock Behavior

By understanding livestock behavior, a host of potential prescriptions can be made. Roath and Krueger (1982) found that livestock demonstrate home ranges much like those shown by wildlife. This, of course, leads one toward the concept of culling animals on the basis of their habitat preference.

Miner et al. (1991) demonstrated that an off-site watering device used under winter-time conditions was able to reduce livestock time spent in the stream by 90 percent. Clawson (1993)

using an off-site watering device was able to show a 20 percent reduction in time livestock spent near the stream even under summer conditions.

Chamberlain (1995) investigated technologies where off-site watering could be accomplished. Of the possibilities presented by stream-driven hydrologic ram pumps and/or animal activated (nose) pumps, he demonstrated the feasibility of using portable solar-powered pumps.

Clawson (1993) also investigated water gaps size and configurations to determine feasibility in using watergaps to reduce animal access and time spent in the riparian zone. He was following up on work which was later published by Larsen et al. (1994) which suggested that buffer strips of as little as one meter in width reduced the introduction of fecal-borne coliform bacteria into the stream by 90 percent. Clawson (1993) found that watergaps do, indeed, have a dramatic impact and was able to eliminate direct deposition of feces into the stream through a combination of watergap sizes and configurations.

Of course, centuries-old technologies of fencing and/or herding represent ways of controlling herbivores so that they graze riparian and upland watersheds by prescription, not by default. Tiedemann and Quigley (1993) have experimented with "fenceless fences" that employ electronic boundaries and deterrents to site-specific areas. Herding may be being re-discovered as well. Several studies contemplating such cost/benefit relationships are underway.

Grazing Strategies

Several studies have been done where grazing strategies have been employed to encourage specific plant community responses. Buckhouse and Elmore (1993) have constructed a matrix where they have compared natural stress against human-imposed response. Generally speaking one can classify these strategies in terms of plant growth/development and watershed response (Figure 1). This might be summed up as follows:

Usually grazing on frozen ground when plants are dormant has minimal impact on either vegetation or infiltration, and may be used to foster woody vegetation.

Early growth season grazing — as long as it is terminated before soil moisture is gone — seems to work well on well drained soils. One should be alert to potential compaction problems on poorly drained soils, however. Riparian grazing during the growing season (season-long grazing) tends to be detrimental in terms of plant and watershed responses.

Post-reproductive stage grazing is a mixed bag. It tends to favor herbaceous vegetation at the expense of woody vegetation (on those streams which are classified as "sedge and rush dominated without a natural woody component" this may work well, however). This post-reproductive stage frequently is dry and therefore at minimal risk for compaction and additionally may have some wildlife benefits especially for sites used earlier in the growing season by ground-nesting birds.

As one attempts to balance a sustainable grazing system with a sustainable watershed, it becomes obvious that soil physics, watershed (especially infiltration), plant growth and development factors/responses, and animal behavioral responses all must be factored in. With care it can be done.

HOW DO WE GET THERE FROM HERE?

Wishful thinking isn't going to do it. A combination of approaches is necessary. I believe they are:

Site Classification

Before you can determine what you want your site to provide, you must know what it is capable of producing. Watershed classification (Swanson et al. 1988) makes sense.

Vision

Create a vision of what you want the area to be like. Without that mind's eye picture you will have trouble achieving success.

Goal Setting

Clear, written goals, then objectives, will enable you to establish the directions and time frames necessary for watershed planning.

Planning

Follow a standard planning outline to establish goals, objectives, alternatives, methods, and flexibility appropriate to your plan.

Monitoring

If you don't plan, you won't know where you are going. If you don't monitor, you won't know when you get there. Bedell and Buckhouse (1994) and Bauer and Burton (1993) give some sensible advice on watershed uplands and riparian zones, respectively.

CONCLUSION

Watershed-ecosystem management as espoused by the Oregon Cattlemen's Association, the Oregon Department of Environmental Quality, the U.S. Forest Service, and the Oregon State University Department of Rangeland Resources Extension Service is based upon ecological reality, social acceptability, and economic viability (Buckhouse 1995). This balancing act is

complex and ever-shifting. But the stakes are too high to ignore. Sustainable ecosystems depend upon our diligent efforts to learn about and to manage our natural resources.

LITERATURE REVIEW

Bauer, S.B., and T.A. Burton. 1993. Monitoring protocols to evaluate water quality effects of grazing management on western rangeland streams. EPA 910-R-93-017. USEPA. Region 10. 1200 6th Avenue, Seattle, WA.

Bedell, T.E., and J.C. Buckhouse. 1994. Monitoring primer for rangeland watersheds. EPA 908-R-94-001. USEPA. Region 8. 999 18th Street, Denver, CO.

Buckhouse, J.C. 1995. OCA Watershed-Ecosystem Programs (WESt). *IN*: *The Grazier*. Number 281:5-7.

Buckhouse, J.C., and W. Elmore. 1993. Grazing practice relationships: Predicting riparian vegetation response from stream systems. *IN*: Bedell, T.E. (ed.). 1993. Watershed Management Guide for the Interior Northwest. EM 8436. Oregon State University Extension Service. Corvallis.

Chamberlain, D. 1995. Helping livestock producers achieve riparian improvement through current resource understanding and technology. Abstr. of Papers. 1st Annual Pacific Northwest Water Issues and 1995 Pacific Northwest/Oceanic Conferences. Portland, OR. February 27-28, 1995.

Clawson, J.E. 1993. The use of off-stream water developments and various water gap configurations to modify the watering behavior of grazing cattle. MS Thesis. Oregon State University. Corvallis. 80 pp.

Larsen, R.E., J.R. Miner, J.C. Buckhouse, and J.A. Moore. 1994. Water-quality benefits of having cattle manure deposited away from streams. Bioresource Technology. 48:113-118.

Miner, J.R., J.C. Buckhouse, and J.A. Moore. 1992. Will a water trough reduce the amount of time hay-fed livestock spend in the stream (and therefore improve water quality)? Rangelands. 14:35-38.

Roath, L.R., and W.C. Krueger. 1982. Cattle grazing influences on a mountain riparian zone. Journal of Range Management. 35:100-102.

Swanson, S.R., R. Miles, S. Leonard, and K. Grenz. 1988. Classifying rangeland riparian areas: The Nevada Task Force Approach. Journal of Soil and Water Conservation. 43:259-263.

Tiedemann, A.R., and T.M. Quigley. 1993. Electronic (fenceless) control of livestock in riparian areas. Final Report. USEPA. 35 pp.

NATURAL CONDITIONS

MANAGEMENT STRESS		Low	Medium	Medium	Medium	Medium	High
		Steep. Low sediment load	Steep. High sediment load	Moderate. Low sediment load	Moderate. High sediment load	Flat. Low sediment load	Flat High sediment load
Low	No Grazing	Shrubs ↑ Herbs ↑ Banks ↔	Shrubs ↑ Herbs ↑ Banks ↔ ↑	Shrubs ↑ Herbs ↑ Banks ↑	Shrubs ↑ Herbs ↑ Banks ↑	Shrubs ↑ Herbs ↑ Banks ↑	Shrubs ↑ Herbs ↑ Banks ↑
Low	Dormant Season	Shrubs ↑ Herbs ↑ Banks ↔	Shrubs ↑ Herbs ↑ Banks ↔ ↑	Shrubs ↑ Herbs ↑ Banks ↑	Shrubs ↑ Herbs ↑ Banks ↑	Shrubs ↑ Herbs ↑ Banks ↑	Shrubs ↑ Herbs ↑ Banks ↑
Low	Early growing season	Shrubs ↑ Herbs ↑ Banks ↔	Shrubs ↑ Herbs ↑ Banks ↔ ↑	Shrubs ↑ Herbs ↑ Banks ↑	Shrubs ↑ Herbs ↑ Banks ↑	Shrubs ↑ Herbs ↑ Banks ↑	Shrubs ↑ Herbs ↑ Banks ↑
Medium	Late growing season	Shrubs ↓ Herbs ↑ Banks ↔ ↓	Shrubs ↓ Herbs ↑ Banks ↔ ↓	Shrubs ↓ Herbs ↑ Banks ↔ ↓	Shrubs ↓ Herbs ↑ Banks ↑	Shrubs ↓ Herbs ↑ Banks ↑	Shrubs ↓ Herbs ↑ Banks ↑
Medium	3-pasture Rest-rotation	Shrubs ↓ Herbs ↑ Banks ↔	Shrubs ↓ Herbs ↑ Banks ↔ ↑	Shrubs ↓ Herbs ↑ Banks ↔ ↑	Shrubs ↓ Herbs ↑ Banks ↑	Shrubs ↓ Herbs ↑ Banks ↑	Shrubs ↓ Herbs ↑ Banks ↑
Medium	Deferred rotation	Shrubs ↓ Herbs ↑ Banks ↔	Shrubs ↓ Herbs ↑ Banks ↔ ↑	Shrubs ↓ Herbs ↑ Banks ↑	Shrubs ↓ Herbs ↑ Banks ↑	Shrubs ↓ Herbs ↑ Banks ↑	Shrubs ↓ Herbs ↑ Banks ↑
Medium	Rotation	Shrubs ↓ Herbs ↑ Banks ↔	Shrubs ↓ Herbs ↑ Banks ↑	Shrubs ↑ Herbs ↑ Banks ↑	Shrubs ↑ Herbs ↑ Banks ↑	Shrubs ↑ Herbs ↑ Banks ↑	Shrubs ↑ Herbs ↑ Banks ↑
High	Season long	Shrubs ↓ Herbs ↓ Banks ↓	Shrubs ↓ Herbs ↓ Banks ↓	Shrubs ↓ Herbs ↓ Banks ↓	Shrubs ↓ Herbs ↓ Banks ↓	Shrubs ↓ Herbs ↓ Banks ↓	Shrubs ↓ Herbs ↓ Banks ↓

↓ - decrease

↑ - increase

↔ - no change

Figure 6-4.—Generalized relationships among riparian vegetation response, grazing management practices, and stream system characteristics