

## Cows and Conservation Biology

This is not the first time livestock has graced the cover of *Conservation Biology*. The March 1989 cover featured seven rare breeds of pigs, accompanying an article on the conservation of genetic resources in farm animals. The September 1992 cover showed cows grazing in grasslands along the Rhine River in the Netherlands where cattle are being used to manage vegetation as substitutes for extinct native herbivores such as the ure-ox and wild horse. Conservation biologists are legitimately concerned about the maintenance of genetic variation in domestic species. We also recognize that livestock can be a useful tool for managing or restoring grasslands, especially in cases where native herbivores are extinct or cannot easily be reintroduced or where prescribed burning is not feasible.

The cattle on the cover of this issue send a less optimistic message. They tell a story of bare dirt, manure, eroded gullies, and endless fences slicing through what once was open, wild rangeland. This story is all too familiar to those who know and love the American West. From Canada to Mexico and beyond, few arid and semi-arid landscapes west of the 100th meridian have been free of the influence of livestock, whose "management" has contributed to loss of native vegetation, invasions by alien plants, decline of native fishes due to dewatering of streams for irrigation and degradation of riparian zones, eradication of native carnivores and prairie dogs, diseases in native herbivores, and major changes in fire frequency, hydrology, soils, and other ecosystem properties. Many conservationists claim that livestock has done more damage to the native biodiversity of western North America than all the chainsaws and bulldozers combined. Livestock grazing on public lands is rapidly becoming one of the hottest and most polarized environmental issues in the United States. But what does science have to say about rangeland conservation?

Among terrestrial ecosystems in North America, rangelands have received surprisingly scant attention from ecologists and conservation biologists. Rangeland ecology is more poorly understood than forest ecology, for example. The biodiversity-oriented research that forests have enjoyed in recent years, in part stimulated by political responses to endangered species listings, has not been extended to rangelands; however, the threatened desert tortoise in the southwestern U.S., and perhaps soon the

Sage Grouse and other declining species, may stimulate increased conservation biological research. Most applied ecology done on rangelands has concentrated on narrow aspects of herbivore ecology, forage availability, or on the effects of livestock management on game animals such as mule deer or pronghorn. Rangelands as dynamic biological communities, ecosystems, and landscapes have been virtually ignored.

As part of an effort to correct this imbalance, this issue of *Conservation Biology* features several articles related to rangeland conservation. We encourage more. In one of the first syntheses of literature on the effects of livestock management, Thomas Fleischner shows that "native ecosystems pay a steep price for the presence of livestock," including changes in species composition, disruption of ecosystem functioning, and alteration of ecosystem structure. He rightly advises conservation biologists to pay more attention to the most pervasive land use in western North America. In their paper on the origin of brucellosis in bison of Yellowstone National Park, Mary Meagher and Margaret Meyer conclude that brucellosis was introduced to North America by cattle, transmitted to elk, and thence to bison. The article by Aguirre and Starkey agrees with this scenario for brucellosis, but suggests that the lungworm-pneumonia complex in bighorn sheep involves both native and exotic factors.

Miller, Ceballos, and Reading discuss the 98% decline of prairie dog populations across North America as a consequence of eradication programs for the short-term benefit of the livestock industry. Because prairie dogs are keystone species, the secondary effects of eradication have been enormous. Miller et al. recommend legal protection for prairie dogs and an end to government subsidized eradication programs. Finally, George Wuerthner (our cover photographer) argues in our Diversity column that conservationists may be mistaken in thinking that cows are preferable to condominiums. Overall, agriculture—especially livestock production—has had a much greater influence on the ecosystems of western North America than development. Yet, the response of conservationists to the problem of livestock has been sluggish, perhaps because the cumulative effects of livestock grazing are much less visible to most people than clearcuts, subdivisions, or shopping malls. Wuerthner suggests that restoration of western wildlands with all their native species may require elimination of subsidized grazing and other marginal resource production.

The conservation community is finally opening its eyes to problems related to livestock, but as usual, activism has preceded science. Several books, most notably *Sacred Cows at the Public Trough* by Denzel and Nancy Ferguson and *Waste of the West* by Lynn Jacobs, brought the problem to a popular audience. The Oregon Natural Desert Association and Oregon Natural Resources Council have proposed legislation that would phase out livestock grazing within a network of wilderness areas in eastern Oregon. Similar bills are being drafted for other states, though none has yet been introduced to Congress.

Should conservation biologists link arms with activists in efforts to reform grazing practices? Activists increasingly seek support from scientists on environmental policy issues. Experience suggests that activists and scientists can form powerful coalitions to influence public policy. The National Wildlife Federation, one of the largest, most conservative, yet most influential environmental groups in the U.S., helped scientists circulate an open letter to President Bill Clinton, Interior Secretary Bruce Babbitt, and Agriculture Secretary Mike Espy. The open letter acknowledges that livestock grazing has taken a heavy toll on native ecosystems in the

arid and semi-arid West, urges dismantling of the heavily politicized and rancher-dominated grazing advisory boards established by Secretary Babbitt, and proposes an opportunity for the scientific community (not limited to range management scientists) to provide advice on conservation of rangelands. Over 200 scientists signed the open letter.

In this endeavor scientists acted as concerned citizens to advocate a reevaluation of public policy. The extent to which scientists should involve themselves in policy debates is controversial. Some scientists question whether any kind of "advocacy" is proper; others, including me, believe scientists have a professional responsibility to provide advice on policy issues in their area of expertise. As I've written elsewhere, environmental policy is too important to be left to the policy makers, most of whom know and care little about biodiversity. A resolution passed by the Society for Conservation Biology at its 1993 annual meeting, which calls attention to the damage caused by livestock grazing and urges major policy reform, is consistent with the view that scientists and scientific societies should express their judgments in policy debates.

We can expect a clash of expert opinions on the livestock grazing issue, just as scientists disagree—publicly and often adamantly—about effects of nuclear power generation, whaling, and clearcutting. Scientists with direct or indirect links to industry can be expected to defend the status quo, whereas others without such ties may advocate reform. Predictably, defenders of the status quo in range management believe that the null hypothesis of grazing (as currently practiced) causing no damage to rangelands has not been falsified; therefore, any scientist or scientific society that takes a position against current policies is behaving unprofessionally. By this reasoning signing the open letter sponsored by the National Wildlife Federation was pure advocacy and not appropriate behavior for scientists. Curiously, advocacy of the status quo is considered quite proper. Many range managers and scientists react defensively when their approach to livestock management is challenged by either activists or other professionals. These managers and researchers would apparently rather commit the Type II error of claiming no negative effects of grazing than to commit a Type I error of claiming effects when none is evident. But as argued by many scientists and philosophers in recent years (see, for example, *Method in Ecology* by K. S. Shrader-Frechette and E. D. McCoy), in applied science Type II errors are more dangerous than Type I errors. Many Type II errors have irreversibly negative effects on biodiversity.

Conservation biology has been described as a mission-oriented science. Our mission of contributing to the protection of nature, by conducting research and synthesizing information on relevant problems and possible solutions, rests on the value assumption that native biodiversity and ecological integrity are good things worth restoring. Beginning with this premise, and while recognizing that purely objective, value-free science is a myth as great as the cowboy, biologists are still able to pursue answers to scientific questions about conservation in a reasonably unbiased way. We are able to further the stated objectives of the Society for Conservation Biology: promote research and maintain the highest standards of quality and ethics in this activity; publish and disseminate scientific, technical, and management information; encourage communication and collaboration between conservation biology and other disciplines; educate the public, biologists, and managers in the principles of conservation biology; promote all of the above through provision of adequate funding; and recognize outstanding contributions to the field. Yes, the goal of re-

storing healthy rangeland ecosystems is value-laden, but figuring out the best way to accomplish that goal depends on the highest professional standards.

Conservation biologists who wish to be involved in the science or science/policy interface of range management can contribute to the resolution of problems in several ways: (1) by conducting field research to answer questions about effects of alternative management treatments on the biodiversity and integrity of rangelands; (2) by developing predictive models of the effects of such practices; (3) by devising and testing restoration strategies for degraded rangelands (recognizing that virtually all rangelands are degraded to some degree, but also that timed livestock grazing may be a useful technique for restoring areas dominated by exotic grasses); (4) by synthesizing available information and educating colleagues, students, decision makers, and the general public about threats to rangelands and options for management; and (5) by supplying information, support, and expert testimony to conservationists striving for rangeland reform, provided the reform measures being promoted are consistent with the best available scientific information and opinion. While blanket removal of all livestock from western rangelands may not be justifiable on the basis of science, drastic reductions in grazing almost certainly are.

Rangelands, like all ecosystems, are more complex than we can ever think (to paraphrase Frank Egler). Until we have answers to the specific questions of rangeland ecology, if we ever will, the most prudent course is to take what information we have on rangeland health and what threatens it, and then forge a conservative policy that minimizes further damage. This we know: cattle are not native to our rangelands and they and those who manage them have caused considerable damage by performing an uncontrolled experiment over virtually the entire extent of rangelands in western North America. With this knowledge alone it is fair to conclude that range management must be drastically reformed if our conservation mission is to be fulfilled. As scientists, we should insist that alternative management treatments are tested and accompanied by adequate control areas where grazing is excluded. In the face of uncertainty, let the burden of proof be on those who would continue grazing to show how it benefits the native ecosystem.

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