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Synthesis Paper

Ranching as a Conservation Strategy: Can Old Ranchers Save the New West?

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Abstract

Working ranches are often promoted as means of private rangeland conservation because they can safeguard ecosystem services, protect open space, and maintain traditional ranching culture. To understand the potential for generating broad social benefits from what have come to be called “working landscapes,” one must consider the synergies of people, environment, and institutions needed to accomplish conservation, as well as complicating factors of scale and uncertainty. Focusing on the problem as it has unfolded in the western United States, we review the state of knowledge about the extent of ranchland conversion; reasons why maintaining working ranches may benefit conservation; and the challenges and opportunities of rancher demographics, attitudes, values, and propensities for innovation. Based on this review, we explore whether the supply of traditional, full-time ranch owners is likely to be sufficient to meet conservation demand, and conclude that although demographic trends seem to suggest that it is not, there exist alternative enterprises and ownership forms that could achieve the goals of ranch conservation. We offer suggestions on how potential shortfalls might be addressed.

Resumen

Los ranchos a menudo se consideran como medios de conservación privada del pastizal ya que pueden salvaguardar los servicios del ecosistema, proteger áreas abiertas y mantener la cultura tradicional del manejo de un rancho. Para entender el potencial que existe al generar beneficios sociales amplios provenientes de lo que se ha venido llamando “paisajes de trabajo,” se deben considerar los aspectos sinérgicos de la gente, del ambiente y de las instituciones involucradas en la conservación, así como otros factores y puntos impredecibles. Enfocándonos en el problema como se ha manifestado en el Oeste de los Estados Unidos, revisamos los conocimientos disponibles sobre cómo la propiedad se ha utilizado para trabajo de rancho; las razones que existen para mantener los ranchos de manera que éstos pueden beneficiar la conservación; los desafíos y oportunidades que enfrenta el rancho, y las actitudes, valores y factores para mejorar. De acuerdo con esta revisión, se evaluó si el tradicional tiempo completo de los rancheros es suficiente para resolver las demandas de la conservación. Se concluyó que mientras que las tendencias demográficas parecen sugerir lo contrario, pueden existir empresas alternativas y formas de propiedad que podrían facilitar la conservación del rancho. Hacemos algunas sugerencias de cómo podrían resolverse estas deficiencias.

Key Words: demographics, ecosystem services, exurban development, innovation, working landscapes

INTRODUCTION

Rural population change and the associated changes in land use, biodiversity, and sociocultural conditions are a topic of concern throughout the globe. Many countries with developed economies are able to put considerable investment in programs that foster the integration of agricultural production with environmental and cultural conservation (Cooper et al. 2005). Such is the case with the European Union’s “Common Agricultural Policy” reforms of 2003 that shift program emphasis from commodity production to joint production of agricultural products and environmental goods and services. Questions of how demographic change among rural popula-

tions may or may not influence such efforts have been the topic of research in the agricultural landscapes of Canada (Filson 1996; Beshiri and Bollman 2001; Robinson 2006), western Europe (Wild and Jones 1988; Batzing et al 1996; Oñate 1998; Paniagua 2002; Kazakopoulos and Gidaraku 2003; Gisbert 2005; Giupponi et al 2006; Lasanta and Marin-Yaseli 2007), Australia (Duncan and Epps 1992; Smailes 1997; Holmes 2002; Costello 2007), Great Britain (Potter and Lobley 1992; Wilkinson et al. 2002), New Zealand (Firth et al. 2007), and the United States (LaGro 1994; Johnson 1998; Gale 2003a; Tavernier and Tolomeo 2004; Brown et al. 2005; Lambert et al. 2007). The western United States, where cattle and sheep producing ranches have long been the most extensive land use and form of agriculture, is undergoing rapid population growth fueled largely by in-migration from other regions. Saving ranches has become a focus of not only of rural traditionalists and livestock producers but also of conservationists, who prefer ranching as a land use over exurban subdivisions, and who see private lands conservation as a needed alternative to underfunded and controversial public acquisition. Ranches are said to safeguard rangeland ecosystem services, protect open space, and maintain a unique

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and cherished American heritage (Knight et al. 1994, 2002; Huntsinger and Hopkinson, 1996; Rosnan 1997; Resnik et al. 2006) while maintaining local property tax revenue and agricultural economies and cultures. Yet little attention has been paid to the question of whether US ranches and ranchers truly can meet the challenge of “saving” the West, and all that this implies.

Exurban sprawl onto US rangelands has been well documented (Riebsame et al. 1996; Theobald 2000; Shumway and Otterstrom 2001), and the ecological implications of rural population growth have received considerable attention of late (Scott et al. 2001; Hansen and Rotella 2002; Maestas et al. 2003). As interest has grown in creating an agricultural industry that can withstand development pressures and maintain open, seminatural landscapes, the term “working landscapes” is increasingly used to express the desire to combine agricultural and environmental benefits in ranching areas (Barry and Huntsinger 2002; Resnik et al. 2006; Silbert et al. 2006). Accordingly, there have been numerous efforts to protect working ranches using private land conservation mechanisms such as land trusts or government-supported open space programs (Alexander and Propst 2002; Land Trust Alliance 2006).

However, as many as 45% of US ranches are being sold each decade (Gosnell and Travis 2005). It is often stated that ranchers are an aging population who are land-rich and cash-poor, and that the purchase or maintenance of a ranch as an economic enterprise is becoming less and less possible. This casts doubt on the feasibility of maintaining ranch land at levels sufficient to conserve ecosystems.

In this paper we explore the literature in search of insights into the potential for ranchers and ranching to fulfill a conservation vision. Conservation through private ownership is a complex process. To succeed practitioners must understand the synergies of people, environment, and institutions that are needed to accomplish conservation, recognizing that some forces such as global climate and economic change occur at scales unaffected by local conservation efforts, and anticipating unpredicted changes in all these factors. Because population growth pressures and conservation opportunities depend partly on factors such as policy and culture that vary across nations, we focus our analysis on one location—the western United States—while recognizing that many of the social pressures, ecological impacts, and policy options are common to, or can be extrapolated to, situations in other rangeland regions. After reviewing recent information about the extent of ranchland conversion, reasons why maintaining working ranches may benefit conservation, and rancher demographics, attitudes, values, and willingness to innovate, we examine some of the assumptions underlying the push toward ranch conservation and some of the forces that challenge even the best-supported efforts. Our goal is to inform strategies within the range profession and society that enhance the long-term sustainability of rangeland ecosystems, especially in places where land use change threatens both biological diversity and social values.

THE EXTENT OF US RANCHLAND CONVERSION

In a way the West is the most urban US region, with more than three-fourths of Westerners living in metropolitan areas.

However, the extent of population-driven land-use change is greater in the rural West than in urban areas because of the dispersed nature of exurban development (Theobald 2000; Sullins et al. 2002). The result is that agricultural land, especially ranch land, is indeed being lost—especially close to high-value recreational amenities or just beyond the edges of metropolitan regions such as Denver, Phoenix–Tucson, San Francisco–Oakland, and Los Angeles, as well as around smaller cities such as Reno, Boise, and Albuquerque. In Colorado, for example, an average 110 000 ha of agricultural land was converted to commercial and residential development every year between 1992 and 1997 (Maestas et al. 2001). In California, the rate of rangeland conversion increases every year, and rangelands are expected to be developed more rapidly than crop or forest lands in the future (CDF-FRAP 2004).

Low-density exurban development ($6\text{--}25$ homes \cdot km⁻²) is the fastest-growing form of land use in the United States (Brown et al. 2005). Moreover this growth has been greatest in the West. Between 1990 and 1997, nonmetropolitan population growth in western states was three times that in the rest of the country (Cromartie and Wardwell 1999). This growth takes two forms that affect ranches. Urban fringe development occurs when residential densities increase at the periphery of metropolitan areas, and is driven mainly by persons who seek more rural lifestyles while maintaining access to jobs and/or services found in urban or suburban areas. Brown et al. (2005) found that exurban development in counties adjacent to cities has increased by a factor of six since 1950. Similarly, most development on Canadian rangelands occurs in areas adjacent to large cities (Beshiri and Bollman 2001). The second form of exurban expansion, amenity development, occurs in the types of rural communities that Shumway and Otterstrom (2001) call the “New West,” i.e., high-amenity settings where demographic change has led to an economic evolution from extractive industries such as ranching or mining to one based on preservation of environmental amenities, thereby creating what geographers have called a “postproductivist” landscape (Holmes 2002). Nationwide the extent of exurban development in counties not adjacent to metropolitan areas grew five-fold since 1950 (Brown et al. 2005).

An instructive case study of ranch conversion and its distribution is offered by Gosnell et al. (2006), who tracked land sales involving ranches of 162 ha or more in the 10-county Greater Yellowstone region between 1990 and 2001. The turnover rate was high: nearly one-fourth (23%) of the large agricultural operations changed hands during the study period, covering 22% of the private land. Only a quarter of these ranches were sold to “traditional” full-time ranchers. Nearly half (46%) went to amenity buyers or part-time ranchers, both of which are likely to retain the land as some form of “working landscape.” Approximately 21% of ranches sold went to developers, investors, or corporations—i.e., the buyers most likely to convert a ranch to other uses. The authors concluded that “fragmentation due to exurban development (beyond the urban fringe) is proceeding more slowly in remote ranching counties than in areas featuring resorts and urban areas” (p. 750). The enjoyment of ranching itself, identification with ranch culture and community, vegetation management needs, tax benefits of an agricultural classification, and other goals can motivate amenity buyers to continue livestock grazing even

though their sources of income may be primarily off-ranch and unrelated to livestock.

There can be a striking degree of variability in fragmentation and ranch ownership types within even this single region (Gosnell and Travis 2005; Gosnell et al. 2006). The authors identified 42 separate landscapes in the study area, then classified them into nine categories based on the degree of land-use fragmentation and owner type. Half of the landscapes fell into the most “intact” fragmentation categories, suggesting that development pressures are unevenly distributed within the region. At a larger scale Shumway and Otterstrom (2001) found that about 20% of western counties remain dominated by agricultural uses, including ranching, but these tend to be farther from highly scenic amenity areas.

It is difficult to determine how much of the conversion is of working ranches. Studies based on land cover and other remotely sensed data (Brown et al. 2005, Hansen et al. 2005) do not indicate whether a given patch of land was being used as a ranch, mine, timberland, or investment property prior to conversion. In addition, conversion of nonranch properties can undermine the stability of nearby ranches. A 2004 survey of California hardwood rangeland owners found that although about 52% of privately owned hardwood rangeland was owned as part of ranching enterprises, another 10% was leased for grazing (Huntsinger et al. 2007b). Once subdivided or purchased for development, former ranches may be used for grazing while speculative private and corporate owners wait to be able to build, often for years or decades. Sometimes this can mean tax benefits for landowners by qualifying them as “agricultural” properties. Ranchers using these lands are aware that this part of their forage base is temporary at best. Recent surveys in California found that almost all ranchers leased some private land, even if they had public allotments, in order to maintain a larger herd, a logical response to the increased number of cattle needed to support a family. Most also stated that there were not enough private leases available, and that they were being lost as parcels were developed (Sulak and Huntsinger 2002, 2007).

WHY PROTECT RANCHES FROM CONVERSION?

Much of the push for ranch protection is rooted in ecological concerns. Ranchers own a large proportion of the private nonforested land in the West, and it is generally land that has not been plowed, dewatered, paved, or dug out. Ranch land generally looks natural and can maintain many ecological processes depending on size and practice. This leads to something of a conundrum, as the public may view ranch land as akin to a park or preserve, with inherent public values that demand access and protection, while the rancher is equally if not more concerned about maintaining control of the property. Habitat for 95% of all federally threatened and endangered flora and fauna is on private land in the United States, and 262 of these species (19%) survive only on private parcels (Wilcove et al. 1996). Additionally, despite the historic role of grazing in vegetation change, soil erosion, exotic plant invasions, and other ecological impacts, today grazing and ranchers can play an important role in maintaining biodiversity.

Some of the most influential research on the ecological value of ranches has been by Richard Knight and colleagues (Maestas et al. 2001, 2003; Lenth et al. 2006) who found that ranches can be more significant for protecting native biotic communities than even nature preserves. This is partly because ranches tend to be on watered sites with better soils (Scott et al. 2001), and partly because ranches have fewer outdoor recreation visitors that can disturb wildlife during critical periods or serve as vectors for invasive nonnative plants (Maestas et al. 2003). Even very low densities of development can negatively affect some biota (Maestas et al. 2001). Although it has been suggested that developments can be designed to reduce impacts, e.g., by clustering dwellings, Lenth et al. (2006) found no evidence that cluster development had any smaller impact on conservation value than dispersed development. Both types of developments were associated with decreases in human-sensitive species and increases in nonnative and human-commensal bird species. The latter situation is undesirable not just from a conservation standpoint but also from a public health standpoint, because some of the same species—house finches (*Carpodacus mexicanus*), house sparrows (*Passer domesticus*), American robins (*Turdus migratorius*), and grackles (*Quiscalus* sp.)—also serve as reservoirs of West Nile virus, which occurs at higher frequencies in areas with low avian diversity (Dobson et al. 2006).

In addition to the ranch itself acting as a refuge from development, grazing can be a useful tool for managing vegetation and habitat. Although public land grazing is not without controversy, California land management agencies with Mediterranean grasslands and woodlands are using livestock grazing as the least costly, lowest risk, and some believe most environmentally benign option for reducing buildup of the high fuel loads generated by nonnative grasses, and for suppressing shrub invasion that once was held in check by anthropogenic and natural burning (Huntsinger et al. 2007a). Studies show that citizens typically find grazing a more acceptable way to reduce fuel loads than mechanical or prescribed burning alternatives (Brunson and Shindler 2004).

Recent research in California surprisingly suggests that using cattle to graze grasses in vernal pool systems contributes to the protection of biodiversity, perhaps because it mitigates the influence of invasion by nonnative grasses that crowd out short-statured natives (Marty 2005; Pyke and Marty 2005). Ranchers themselves may act as “ecosystem engineers” (Jones et al. 1994) that can benefit wildlife, for example, by constructing stock ponds. Ongoing research seeks to explain why some threatened aquatic invertebrates such as the California tiger salamander (*Amystoma californiense*) and red-legged frog (*Rana aurora draytonii*) appear to be more abundant in grazed than in ungrazed stock ponds (DiDonato 2007). The US Fish and Wildlife Service has recognized that ranch stock ponds are a significant portion of the remaining habitat for the threatened California tiger salamander, with about half of the habitat in the San Francisco Bay area occurring on stock ponds (USDI-FWS 2006). Similarly, in the Southwest, stock ponds constructed and maintained by ranchers provide important habitat for the Chiricahua leopard frog (*Rana chiricahuensis*; Sredl and Saylor 1998). Although the impacts of the grazing process itself may not be positive in the second case, management can mitigate these relatively straightforward conflicts.

Of course, not all conservation scientists believe ranching is ecologically benign. Much criticism has been leveled at the direct impacts of grazing livestock (Fleischner 1994; Belsky et al. 1999), but ranching has other potentially negative effects as well. These indirect effects include the following: truncation of the food web because livestock are removed from the ecosystem at or before death whereas native grazers die on site and provide food for decomposers and scavengers, predator control, exotic weed introductions and subsequent use of herbicides, fragmentation due to roads and fences, alteration of fire regimes, and changes in water flows and quality (Freilich et al. 2003), though it may be pointed out that only the first is unique to ranching. It is also important to note that studies showing ecosystem benefits from ranching have thus far been conducted in just a few locations, primarily Colorado or California. Grazing, depending on management and ecosystem, can cause ecological problems, for example those noted in the Colorado Plateau region of the Southwest (Warren and Eldridge 2001; Neff et al. 2005), that might outweigh possible benefits. Reducing conflicts between environmental benefits and grazing, and finding synergies, is key to the effectiveness of maintaining ranch lands as conservation efforts, and may require compromise on both sides. On the other hand, we know of no research showing that exurban housing development is less environmentally damaging than ranching.

Another frequently argued rationale for ranchland protection is cultural. Starrs (2002) points out, "almost everyone is in some way enchanted by the lifestyle." The culture of the American West, with its themes of heroic deeds in a larger-than-life landscape and a struggle against adversity both anthropogenic and natural, has relied heavily on images of livestock production (White and Limerick 1994; Starrs 1998). Perhaps the most telling evidence of the pervasiveness of these images is the success that advertisers and merchandisers have had over the past century in using ranching and cowboy images to sell products (Peñaloza 2000). In truth, for the displaced urbanite who migrates to a New West county the cultural benefits of seeing and/or experiencing a working ranch may be as much of a draw as the region's endless vistas, rugged mountains, and teeming trout streams (Riebsame 1997; Taylor 2004). Thus the people for whom ranching culture is an attraction have an incentive to find ways to maintain ranches in their localities.

A third, closely related value associated with ranches is open-space protection. Seeing the "countryside" within aesthetically pleasing viewsheds is important to many living in urban and exurban areas. Nearly 1000 state and local governments nationwide held open-space referenda between 1998 and 2003, with about 80% passing (Kotchen and Powers 2006). The nonprofit Land Trust Alliance (2006) reports that the land area conserved in the United States by local, state, and national land trusts in the period 2000–2005 increased by 54%, with the West being the fastest-growing area in land conserved and in land trusts created. Fully 44% of the 11.8 million hectares conserved by local and regional land trusts through 2005 were located in western states, with the majority of that area in some sort of grazing use. Increasingly nongovernment organizations (NGOs) are working with ranchers to protect biodiversity while keeping the land in use

as a private, working ranch (Alexander and Propst 2002; Resnik et al. 2006), rather than creating a traditional "protected area." Typically this entails acquisition by an NGO of development rights while ranchers continue to raise livestock, although other groups, most notably The Nature Conservancy, have themselves elected to go into the ranching business. Maintaining lands as working ranches is held to prevent deterioration of the tax base by public acquisition, preserve infrastructure, support the ranching community, and maintain local culture.

Ranching links private and public lands by relying on them to carry out the production cycle of the enterprise. In some ways they are interdependent. By one estimate, more than 40 million hectares of high-value, private rangelands are linked to federal grazing permits (Gentner and Tanaka 2002). Ranches buffer public lands from development and high-intensity land uses that would clash more severely with wildlife, scenery, recreation, and management practices such as controlled burning. Unfortunately, ranches adjacent to public lands are especially attractive for development (Riebsame et al. 1996), with ominous consequences for biodiversity protection because lands adjacent to reserves are especially important as locations for dispersal of organisms and connectivity between protected patches (Hansen and Rotella 2002). In a study in the southern Rockies, Talbert et al. (2007) found that 32% of private land within 1 km of the border of Forest Service and Bureau of Land Management (BLM) land in Routt County was the ranch land of grazing permittees. At the same time, permitted grazing on federal lands is in decline, making the ranches using those lands less viable as economic units.

There also are economic benefits to protecting ranches. Although ranching itself may not contribute as much to local economies as more intensive land uses, it has persisted largely on lands that, prior to the recent rural migration phenomenon, were largely not viable for other uses. Subdivision changes that equation—for example, short-term revenues to communities through wages and local purchases far outweigh the value of livestock produced (McLeod et al. 1998). However, the fiscal impacts of subdivision can be enormous, and depending on pattern and location can be costly in terms of needs for new services, in some cases outweighing benefits. Open rangeland has multiple forms of value (Fausold and Lilieholm 1999), many of which have not been well defined or quantified, making evaluation of tradeoffs inaccurate at best. For example, ranching enhances tourist experiences even if the visitor never actually sets foot on a ranch but only views them: a 2005 study of visitors to Steamboat Springs, Colorado, found that if existing ranchlands were replaced with urban uses, the cost in tourism expenditures would amount to \$70 per visit, or \$25 per visitor per day (Ellingson et al. 2006). Finally, ranches are well positioned to enter the rapidly expanding market for locally produced foods. For example, a significant source of support for the farmers that participate in the Marin Agricultural Land Trust (MALT) north of San Francisco is value-added markets for local, natural, and organic meat and milk (MALT 2007). Ranchers and farmers with conservation easements were found to be more likely to diversify their operations to take advantage of emerging markets (Gale 2003b).

WHAT ABOUT THE RANCHERS?

A fundamental assumption of ranch conservation is that ranchers will remain on the land if given the opportunity. This assumption bears closer scrutiny. One factor that may suggest otherwise is rancher demographics. Huntsinger et al. (2007b) found that the average age of a California rancher was 59. Peterson and Coppock (2001) reported that 37% of respondents in a survey of Utah livestock producers were aged 66 or older, and that 28% of federal grazing permittees and 51% of ranchers operating solely on private land reported they planned to retire within 5 yr. Although “retirement” for a rancher may not mean complete extraction from the operation—ranchers often intend to live out their days in a ranch residence while turning over day-to-day operations to a younger relative—this may account for some of the ranch turnover found by Gosnell et al. (2006) and seems to suggest that the supply of ranchers is dwindling.

Yet it is not clear that the average age of a rancher is increasing. In a longitudinal study, Huntsinger et al. (2007b) found no significant difference in the average age of California ranchers between 1985 and 2004, though attrition may have had an impact on the sample. Moreover, research among farmers in Scotland found that the age of a primary decision-maker was a poorer predictor of how life cycle issues would affect decisions about the farm than an index of the ages of the various people who work there (Burton 2006). No such index exists for US ranchers, so in fact we do not know how rancher age structure might affect the viability of range livestock production as an economic activity.

Research indicates that ranchers are powerfully motivated to ranch, even to the point of using outside income to support their ranch, and have been for a long time (Smith and Martin 1972; Bartlett et al 1989; Liffmann et al. 2000; Torell and Bailey 2000; Gentner and Tanaka 2002). Gentner and Tanaka (2002) found that about half of grazing permittees surveyed in the West significantly supplemented ranch income with outside funds. Ranchers often forego alternative investments at considerable opportunity cost, recouping some or all only when the ranch is sold in a development or amenity-driven market (Hargreave 1993). Having substantial equity tied up in land that can only be cashed out when land is sold for alternative uses is hardly a scenario for sustainability; hence psychological pressure to sell may increase if sale value continues to appreciate while profit margins remain low, as is typically the case (Tanaka et al. 2005).

As development proceeds in an area, it also has consequences for the remaining ranches. One California study found that ranchers working in a matrix of subdivided lands and leased pastures were less likely to control yellow starthistle (*Centaurea solstitialis*) because they assumed weeds on adjacent lands would remain uncontrolled (Neill et al. 2007). Although the vast majority of ranchers in another California study believed it was possible for ranching to continue in their community, those in urbanizing areas were more willing to accept that their ranches would eventually become developed than ranchers in more rural areas, perhaps recognizing that the pressures and temptations that come with urbanization become irresistible beyond a certain point (Liffmann et al. 2000). Beyond what might be termed a “tipping point,” a loss of infrastructure,

forage resources, and community support makes ranching seem nearly impossible.

Public lands grazing is often part of a traditional form of pastoral production known as “transhumance,” where stock are driven to montane range during the summer, and winter on lowland grasslands. This tradition has been part of the western North American landscape since the 17th century, and may be considered an element of ranching culture. Forest Service permittees in the Sierra Nevada reported being more affected by development than their nonpermittee colleagues (Sulak and Huntsinger 2002, 2007). Permittees’ ranches were established earlier—about two-thirds before 1900—than ranches without public permits. In a similar study of federal grazing permittees in Colorado, more than 58% of permits were derived from 19th century homesteads (Rowe et al. 2001). Moving stock to grazing allotments has become more difficult in some locations because development and highways block or reduce access to traditional travel routes. Building trust between ranchers and public agencies, and having a positive outlook about the future of ranching, have been suggested as crucial to reducing tensions between permittees and public agencies (van Kooten et al. 2006). Gosnell et al. (2006) suggest that a shift to ranch ownership by amenity buyers will change “power relations” between public managers and private ranchers in the Yellowstone region as amenity owners with greater resources than traditional ranchers interact with public lands agencies. Property turnover, new kinds of owners, and changing land uses may challenge the ability to develop long-term relationships and to foster trust.

Despite these pressures, some ranchers not only resist selling but take operational or life risks in order to seek pathways to sustaining their operations so they can pass their land on to future generations, and maintain ranches their families may have owned for generations (Wulforst et al. 2006). If ranching is an increasingly difficult occupation in which to make a living, ranchers who wish to remain on the land must be willing to make the management improvements necessary to cope with changing social, political, economic, and environmental conditions. Yet Peterson and Coppock (2001) found that 70% of public land permittees and 90% of private land ranchers had adopted passive, “wait-and-see” management strategies rather than taking steps to improve the viability of their operations. This percentage varies based on location and how questions are phrased; e.g., 74% of respondents to a western Colorado rancher survey reported having made some sort of management change in the previous 5 yr (Kennedy and Brunson 2007).

Ranchers are more likely to make such changes if they have larger operations and use the ranch as their primary income source (Kennedy and Brunson 2007). Because part-time or amenity ranchers may be less likely to sell their ranches if they suffer poor economic results, the tendency for full-time ranchers to be more likely to make management changes is promising. The future and past of an operation also affect the likelihood that ranchers will take steps to improve an operation in the face of change. Innovation is more likely when ranchers believe another member of the family will take over the operation when they retire (Didier and Brunson 2004; Kennedy and Brunson 2007), and also when the ranch has been in the same family for multiple generations. Didier and Brunson (2004) found that a sense of obligation to one’s predecessors

increases the likelihood of adopting management innovations, as did a desire to prove to “the public” that ranching can be done in an environmentally sound manner.

The relationship between ranchers and the public is not always straightforward. In a survey of ranchers in two areas of California undergoing rapid exurban development (Liffmann et al. 2000), a majority reported that “society’s hostility to ranching” was a reason to quit the business. However, it’s not clear that society is hostile to ranching at all. For example, a spring 2006 survey of Colorado residents (Hull et al. 2006) found that three-fourths felt agriculture was very important to the quality of life in the state, and even more (83%) said it is very important to maintain land and water in agricultural production. More than half (57%) agreed that agriculture in Colorado protects the environment, 72% believe farm and ranch animals are treated humanely, and 78% agreed that ranchers with permits to graze on public lands treat the land appropriately. Open space and wildlife habitat protection were found to be as important as food and fiber production as reasons for protecting agricultural land. In a national survey more than three-quarters of respondents supported the idea of using public funds to support agriculture as long as it provided environmental benefits (American Farmland Trust 2001).

This does not mean citizens view every aspect of ranching positively. Livestock grazing on public lands has been found to interfere with citizens’ enjoyment of outdoor recreation experiences (Johnson et al. 1997; Brunson and Gilbert 2003), although this result is less pronounced when it occurs on multiple-use lands rather than in wilderness or protected areas, and also when visitors expect to encounter cattle (Mitchell et al. 1996). Other impacts of ranching that have caused negative impressions among neighbors include odors, cattle trespass on neighbors’ properties, and automobile accidents on open range (Ellickson 1991).

Public perceptions of ranching’s negative impacts differ among rangeland constituencies. A statewide Nevada survey found that urban residents, recent arrivals, and nonranchers were more critical of the condition of grazing lands than were ranchers, long-term residents, and rural residents (L. Huntsinger, unpublished data, 1996). Other studies conducted on the BLM’s Vale District in eastern Oregon (Huntsinger and Heady 1988) and in southern Utah’s Grand Staircase–Escalante National Monument (Brunson and Gilbert 2003) found that recreationists from urban areas were more critical of rangeland conditions than were other constituencies. Huntsinger and Heady (1988) also found that BLM managers and nonranching community members perceived more problems with rangeland condition than did permittees. Gosnell et al. (2006) point out that such differences of opinion may become more common even within the ranching community. They suggest that even if amenity owners maintain grazing on their properties, they may object to traditional ranch practices such as predator control and some forms of vegetation management.

INSTITUTIONAL AND ECONOMIC CHALLENGES

Important questions must be answered if we are to maintain the viability of ranch conservation in the West. If ranchers are

indeed aging and headed for retirement, the issue of how large properties can be sustained and transmitted intact across generations is critical. Addressing the issue requires attention to several key aspects of rangeland socioeconomic systems, including access to public lands for grazing; the treatment of ranch lands in state and federal tax codes; the role of land-use planning and regulation; the availability of landowner incentives such as conservation easements, cost-sharing programs, and direct payments; and training for a new group of ranch management professionals. Range scientists, managers, and educators all must be part of the policy dialogue.

Instability in the availability of forage on public lands affects the stability of private ranch lands, and potentially the efficacy of tools such as conservation easements. Ranchers unsure of access to the forage base they need for a viable herd size are highly reluctant to commit to a conservation easement that affects their use of the land “in perpetuity.” Studies in California (Sulak and Huntsinger 2002, 2007) found that public land ranchers in two case study areas estimated that on average nearly half of their income was attributable to having access to public leases—even though the ranchers were in very different areas and leasing from very different agencies. One-third to one-half stated they would have to sell their ranches if they lost their public lands allotments, because the operation would no longer be viable. In recognition of this relationship, in Pima County, Arizona, conservation easements may be vacated by ranchers if public grazing leases are lost through no fault of the permittee (Sayre 2006). In the highly developed San Francisco Bay area, Sulak and Huntsinger (2007) found that the criteria used by public land agencies, such as utility districts and parks, to select lessees were shaping the characteristics of the ranch community of the future, as public leases were one of the few relatively stable sources of forage. Private leased grazing lands, in contrast, were at constant risk of development.

It has long been a fact that the value of ranch land for development far outstrips the value of the land for production. Consumptive and quality-of-life values have been the most important reasons for the purchase and maintenance of ranches for decades (Torell and Bailey 2000). Yet it is held that in order to increase ranch sustainability, a rancher needs more ways to turn a profit, because positive cash flow can make the difference between a rancher deciding to keep the ranch vs. selling it. Throughout much of the 20th century, considerable effort by ranchers, researchers, and advisory agencies has gone into increasing the profitability of ranching, with limited success. Some are turning to niche markets such as grass-fed beef and lamb, but for the most part ranchers are “price-takers” because of competition with grain and other feed production, and the intensive livestock production based on it. Ranches may not turn a profit on a yearly basis, particularly when opportunity costs are considered (Torell and Bailey 2000), but they almost always turn a profit, and enough to compensate for years of forgone opportunity costs, when they are marketed as real estate.

The possibility of marketing “ecosystem services” has gained attention as ranchers view activities such as carbon sequestration and wildlife habitat as potential ways to increase income. At a January 2007 forum in Albuquerque sponsored by the nonprofit Quivira Coalition, it was suggested that ranchers

could learn from European methods of conserving landscapes with direct government payment for certain forms of production or environmental services (Cooper et al. 2005). But often such payments go hand-in-hand with land-use controls that US ranchers would likely find draconian. European payments in part compensate agriculturalists for the loss of opportunity to develop their lands. American ranchers as a group are known to be quite protective of “private property rights,” hostile to regulation, and very attached to the idea that they can do what they like with their own land (Huntsinger et al. 2004, 2007b; Jackson-Smith et al. 2005). Moreover, ranchers’ willingness to adopt socially desirable range management objectives has been found to be negatively correlated with beliefs that property rights are being eroded (Kreuter et al. 2006).

Even so, voluntary conservation easements, as a form of compensation that precludes development “in perpetuity” in order to secure ecosystem services, are acceptable to many ranchers, especially when the easement programs are managed by ranchers’ organizations (Pritchett et al. 2007). A comparison of ranchers in Spain and California showed that ranchers will forgo opportunities or manage in certain ways for the public benefit if compensated by the public or private enterprises (Huntsinger et al. 2004). A promising program was initiated in March 2007 by the Chicago Climate Exchange, a private enterprise that promotes reduction of greenhouse gas emissions through the trade of “credits” for carbon dioxide, methane, nitric oxide, and other chemicals (Chicago Climate Exchange 2007). The program now offers to pay ranchers who store carbon through rangeland rehabilitation or sound range management.

Tax relief for agriculture, and cost-share programs, are other ways that the American public pays for ecosystem service from ranches. These can operate at national to local levels (Daniels 2001; Johansson 2006). For example, the federal Environmental Quality Incentives Program and the Wildlife Habitat Incentives Program of the Natural Resource Conservation Service provide matching funds for carrying out range improvements that provide wildlife habitat, reduce pollution and erosion, and promote other environmental benefits. At the state level California and Texas both offer landowner incentive programs that provide payments to landowners implementing habitat management plans that benefit special status species, and the California Land Conservation Act of 1965 limited property taxes when ranchers agree to keep land out of development for 10 yr via a rolling contract. At the county level, California’s Alameda County has developed the Wildlife-Friendly Pond Restoration Program. The program helps ranchers negotiate the permit process, provides technical assistance, helps put together funds from a variety of sources, and offers a safe harbor agreement, if ranchers agree to maintain stock ponds in a way that provides habitat for two threatened species, the California tiger salamander and the red-legged frog (Environmental Defense 2007).

Zoning and planning offer pathways to conserve ranchland and can provide downward pressure on speculative land prices, but in the United States zoning has proven relatively ineffectual. Too often, development money provides ample illustration of the flexibility of “urban limit lines.” Oregon’s passage of Measure 37, the “land-use fairness” law that requires compensation for land-use restrictions, is another illustration of the difficulty of implementing agriculture or open-space

protections through zoning. Ranchers who wind up outside an urban limit line often feel that they have had their assets devalued by governmental fiat, and this perception of injustice contributes to the instability of the designation. Liffmann et al. (2000) found that in California, as regions become more urban, ranchers grow increasingly apprehensive about the impacts of local land-use planning.

If ranchers are indeed aging and headed for retirement, the issue of how large properties can be transmitted across generations intact is also critical. Johnson (1998) found that inheritance taxes were considered a primary barrier to ranch transmission in California. Reduced inheritance taxes and other tax breaks are promoted as ways to reduce the costs of keeping land in the family, and sustaining ranches. However, such tax relief requires a significant public investment in exchange for very little assurance of an ecological “return.” A ranch might be passed on with the benefit of reduced taxes, but sold for development at any point, resulting in a loss of the ecosystem services the tax breaks were supposed to conserve. At the same time, the rancher reaps the full benefit of land appreciation that has accrued. This same issue plagues other provisions of public funds, as when the public provides matching funds for habitat improvements and land investments. The public may make a substantial investment in a ranch through US Department of Agriculture cost-share programs but lose the benefit of that investment when the ranch is sold and converted. One reason why conservation easements have proven so appealing to conservation groups and the public is that they provide some guarantee of a long-term return. It is possible that public and private investment in wildlife habitat improvement and agricultural infrastructure may gravitate towards lands under conservation easement or some other protected status for this reason. Otherwise, investing public money in ranches is risky business.

In many parts of the West where urban fringe development is expanding rapidly, local and county governments have taken steps to acquire title to ranch properties in order to protect open space and related values (Resnik et al. 2006). However this adds to the proportion of a county’s land base that is not on the property tax rolls, and it is not clear that municipalities often have the expertise to manage rangelands. Moreover, many residents of the western United States, including ranchers, tend to be suspicious of government land acquisitions in a region where more than half of the land in many states is managed by federal and state agencies.

Are there other mechanisms for stabilizing land tenure that can assure the long-term return from conservation investments in ranching? And will ranchers accept them? A Texas study found that landowners tend to be wary even of market-based conservation incentives if they are novel and there is less than full trust of the entity offering the incentive (Wilmot and Brunson 2005). An important constraint to such options is the fact that ranchers want to be ranchers, and often as not pay for the privilege by working off-ranch; policies, incentives, or markets that restrict activities that landowners consider “ranching” will impair voluntary initiative and compliance, and may lead to more ranch sales. Some ranchers in a California study were passionate about how a “hassle factor”—the difficulty of working with regulatory—was taking all the enjoyment out of ranching (Forero 2002). These questions need to be answered, and it may well take adjustments to the existing laws governing

private-land incentive transactions in order to ensure their utility for conservation.

WHERE DO WE FIND TOMORROW'S RANCHERS?

Another emerging problem with the transmission of ranches to the next generation is that some ranchers have no heir willing to work the ranch. In studies in California and Colorado the lack of an heir to pass land on to was the primary reason ranchers felt they might need to sell the property (Rowe et al. 2001; Sulak and Huntsinger 2002). Even if a ranch is restricted from development by a conservation easement, the sale price often remains higher than can be justified by production alone, making it difficult for prospective new ranchers to enter the business. In January 2007 the largest noncommercial real estate transaction in California history took place when a Los Angeles investment group purchased the 10 000-ha Cojo and Jalama ranches for \$155 million, or about \$15 000 per ha, "well within the range for ranchland in that area" (Casselman 2007). A smaller ranch next door, suitable for vineyard production, sold for \$47 000 per ha in 2005. Land prices restrict the entry of new ranchers into the business, and estate taxes squeeze heirs even if they want to continue ranching.

The market for intact ranches might therefore further the trend toward amenity purchases, in line with the trend reported for the Yellowstone region (Gosnell et al. 2006). In fact, a longitudinal study of hardwood rangeland landowners in California found a significant increase in managing for natural beauty and lifestyle values, and a decline in those managing the ranch primarily for a family business between 1985 and 2004 among livestock producers (Huntsinger et al. 2007b). The hobby ranch, historically looked down upon as a reason for depressed livestock prices, may be transformed into the "conservation" ranch in the new West.

In an Arizona study conducted in 1969, Smith and Martin (1972) concluded that if a rancher's children do not want to take over the ranch, "the ranch will most likely be taken over by an investor who is not significantly dependent on the local community for his economic livelihood," and "sufficient funds for ranch purposes are not likely to be available to participants in the local nonranching economy" (p. 224). From our point of view this trend seems to be more important than ever. The ranchers of the next generation could increasingly be the lessees, managers, or caretakers of ranch properties owned by those with the capital to buy them.

This circumstance, in turn, will create a new market for range management education: professional ranch management. This will be important for traditional family ranches as well as new forms of ranching ownerships. Family ranchers often have relatively little training in range science, having focused on agribusiness or animal science in their education because of its obvious importance to a livestock business enterprise. However, if ranching is to be promoted and financially aided as a conservation activity, then the people managing ranches must know more about the land and ecosystems they are asked to conserve. Especially at universities where range science and animal science are not in the same department or college, range educators will need to improve integration of the various

aspects of ranch enterprises. A few such degree programs have begun to emerge (e.g., the King Ranch Institute for Ranch Management at Texas A&M-Kingsville) but more will be needed. Conversely, students of rangeland or wildlife management often emerge with a weak understanding of ranchers and the business aspects of ranching, but building relationships with landowners and managers is obviously an important key to conserving private rangelands. Involving the ranching community in the development and implementation of educational programs for range students would help meet the challenge.

Whether amenity owners will hire professional managers and maintain the livestock enterprise will depend on a number of factors, including whether their desire to own a ranch is at least partly due to being a "rancher." In a national study of agricultural properties protected by conservation easements, it was found that even when properties were purchased primarily for residential use, they remained in agriculture, as purchasers leased the land for grazing or farming (Sokolow 2003). Motives for continued grazing may be tax benefits derived from an agricultural status, income from livestock as a supplement to the landowner's income from other sources, the restrictions of a conservation easement, a desire to participate in ranching culture, or vegetation and habitat management. Amenity owners will need to draw on the available pool of "professional ranch managers" on a consulting basis or as professional in-house managers, and it is vital that such professionals know range science as well as the livestock business. The expectations of those who want to invest in private range conservation call for knowledge-based stewardship of rangeland ecosystems.

Ranchers and the public jointly consume a variety of ecosystem services produced by ranches. Both may enjoy the natural environment of the ranch, the view, the wildlife, and ranching culture. The rancher also enjoys the legacy value of the ranch, income from products, and the ability to exclude others from the boundaries of the ranch. Both can enjoy leaving the ranch to future generations. Today conservation easements, cost-share programs, and tax relief are the ways that the public contributes to the production of ecosystem services from ranches. New institutions and policies may emerge that provide for further public investment in working landscapes in exchange for stewardship of ecosystem services by ranchers and rangeland landowners, but we suggest that land-use stability should be an overt goal and perhaps even a condition of such programs.

Most US ranchers today live on the ranch with their families. Although they enjoy living in the natural environment, working with animals, and raising a family on a ranch, they cherish the opportunity to have relative autonomy in management decision making and to find the work "different every day" (Huntsinger et al. 2004). How well this rancher fits the future ranch, likely to be part of a landscape mosaic that is increasingly shaped through easements, land-use planning, regulations, amenity ownerships, and public lands grazing policies (Fairfax et al. 2005), remains an open question.

IMPLICATIONS FOR POLICY AND MANAGEMENT

In this paper we have attended primarily to the factors affecting conservation of the individual ranch. However, in order to

maintain ecosystem processes and conserve habitat and water at an ecologically effective scale, it may take a community of ranches working together and with public agencies. Socially, a “critical mass” of ranches is also needed to support the infrastructure, markets, and human relationships that keep a ranch culture and industry alive. Having such a community, and striving to meet new goals in environmental stewardship, may in turn help solve some of the problems plaguing the internal dynamics of ranch sustainability. For example, the daughter of Bill McDonald, one of the founders of the Malpai Borderlands Group, a group of ranchers dedicated to preserving land and ranching culture in the Southwest, wrote in a recent newsletter:

One of the biggest lessons provided by the Malpai experience has been that as a cattle rancher, I would not simply be a mender of fences, a mover of cattle, and a seller of calves, but I would be part of something meaningful, something much larger than the sum of its parts—for me, this is an irresistible draw. I believe that the success of Malpai and the proliferation of similar collaborative efforts will provide inspiration for young people across the country to maintain these traditional livelihoods (McDonald 2007).

The Malpai group may be the best-known such ranchers’ group today, but one can find similar efforts occurring at watershed, valley, or community scales in several parts of the United States. At a regional level, the nonprofit Quivira Coalition has established a “New Ranch Network” in order to “support a rancher or other landowner in ‘making the leap’ to progressive stewardship through collaboration” (Quivira Coalition 2007). Nationally The Nature Conservancy strives for collaboration with groups of ranchers and other landowners in order to achieve conservation results at scales where direct land purchase is impractical (The Nature Conservancy 2007). Public land and technical assistance agencies, along with professional organizations such as the Society for Range Management, can and should participate in such efforts as well.

Communities of sustainability, new kinds of owners, a rising group of natural resource-oriented ranch managers, and complex mosaics of ownership and obligation: this will indeed be a “new West,” but it seems likely that it cannot be saved by “old ranchers” alone. “New ranchers” must find agencies, neighbors, and publics that share their vision.

LITERATURE CITED

- ALEXANDER, B., AND L. PROPST. 2002. Saving the family ranch: new directions. In: R. L. Knight, W. C. Gilgert, and E. Marston [EDS.], *Ranching west of the 100th meridian: culture, ecology, and economics*. Washington, DC, USA: Island Press. p. 203–217.
- AMERICAN FARMLAND TRUST. 2001. Protecting our most valuable resources: results of a national opinion poll. Available at: <http://www.aftresearch.org/farmland/pollresult.html>. Accessed 1 January 2007.
- BARRY, S., AND L. HUNTSINGER. Will California’s working landscapes keep on working? *Rangelands* 24:6–10.
- BARTLETT, E. T., R. G. TAYLOR, J. R. MCKEAN, AND J. G. HOF. 1989. Motivation of Colorado ranchers with federal grazing allotments. *Journal of Range Management* 42:454–457.
- BATZING, W., M. PERLIK, AND M. DEKLEVA. 1996. Urbanization and depopulation in the Alps (with 3 colored maps). *Mountain Research and Development* 16:335–350.
- BELSKY, A. J., A. MATZKE, AND S. USELMAN. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. *Journal of Soil and Water Conservation* 54:419–431.
- BESHIRI, R., AND R. D. BOLLMAN. 2001. Population structure and change in predominantly rural regions. Ottawa, Canada: Statistics Canada. Rural and Small Town Canada Analysis Bulletin 2(2). 15 p. Available at: <http://www.statcan.ca/english/freepub/21-006-XIE/free.htm>. Accessed 5 October 2007.
- BROWN, D. B., K. M. JOHNSON, T. R. LOVELAND, AND D. M. THEOBALD. 2005. Rural land-use trends in the conterminous United States, 1950–2000. *Ecological Applications* 15:1851–1863.
- BRUNSON, M. W., AND L. GILBERT. 2003. Recreationist responses to livestock grazing in a new national monument. *Journal of Range Management* 56:570–576.
- BRUNSON, M. W., AND B. A. SHINDLER. 2004. Geographic variation in social acceptability of wildland fuels management in the western U.S. *Society and Natural Resources* 17:661–678.
- BURTON, R. J. F. 2006. An alternative to farmer age as an indicator of life-cycle stage: the case for a farm family age index. *Journal of Rural Studies* 22:485–492.
- [CDF-FRAP] CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION, FIRE AND RESOURCES ASSESSMENT PROGRAM. 2004. Development projections. Available at: http://frap.cdf.ca.gov/projects/development_vegetation/dp_figs%5Cfcst_cal.GIF. Accessed 5 October 2007.
- CASSELLMAN, B. 2007. Nine beachfront miles of Pacific coastline. *Wall Street Journal* 12 January 2007. Available at: <http://www.realestatejournal.com/columnists/private/20070115-private.html>. Accessed 5 October, 2007.
- CHICAGO CLIMATE EXCHANGE. 2007. Rangeland soil carbon management offsets. Available at: <http://www.chicagoclimatex.com/content.jsf?id=1101>. Accessed 25 January 2008.
- COOPER, J., J. BERNSTEIN, AND R. CLAASEN. 2005. Overview of agri-environmental programs in the European Union and the United States. *Farm Policy Journal* 2:31–41.
- COSTELLO, L. 2007. Going bush: the implications of urban–rural migration. *Geographical Research* 45:85–94.
- CROMARTIE, J. B., AND J. M. WARDWELL. 1999. Migrants settling far and wide in the rural West. *Rural Development Perspectives* 14:2–8.
- DANIELS, T. L. 2001. State and local efforts in conserving privately-owned working landscapes. Available at: <http://www.nga.org/cda/files/LANDSTATELOCAL.pdf>. Accessed 5 October 2007.
- DIDIER, E. A., AND M. W. BRUNSON. 2004. Adoption of range management innovations by Utah ranchers. *Journal of Range Management* 57:330–336.
- DiDONATO, JOSEPH. 2007. Endangered amphibian research within grazed grasslands. *Keeping Landscapes Working, A University California Cooperative Extension Newsletter for Rangeland Managers* Winter:4–6. Available at: <http://cesantaclaru.ucdavis.edu/newsletterfiles/newsletter710.htm>. Accessed 5 October 2007.
- DOBSON, A., I. C. CATTADORI, R. D. HOLT, R. S. OSTFELD, F. KEESING, K. KRICHBAUM, J. R. ROHR, S. E. PERKINS, AND P. J. HUDSON. 2006. Sacred cows and sympathetic squirrels: the importance of biological diversity to human health. *PLOS Medicine* 3:0714–0718.
- DUNCAN, C. J., AND W. R. EPPS. 1992. The Demise of countrymindedness—new players or changing values in Australian rural politics. *Political Geography* 11:430–448.
- ELLICKSON, R. 1991. *Order without law: how neighbors settle disputes*. Cambridge, MA, USA: Harvard University Press. 316 p.
- ELLINGSON, L., A. SEIDL, AND C. J. MUCKLOW. 2006. Tourists’ value of Routt County’s working landscape, 2005. Fort Collins, CO, USA: Department of Agriculture and Resource Economics/Routt County Extension Office, Colorado State University Cooperative Extension Report EDR-06-05. 12 p.
- ENVIRONMENTAL DEFENSE. 2007. Alameda County’s program restores ponds and helps rare animals. Available at: <http://www.environmentaldefense.org/article.cfm?contentID6295>. Accessed 5 October 2007.
- FAIRFAX, S. K., L. GWIN, M. A. KING, L. RAYMOND, AND L. A. WATT. 2005. *Buying nature: the limits of land acquisition as a conservation strategy, 1780–2004*. Cambridge, MA, USA: MIT Press. 357 p.
- FAUSOLD, C. J., AND R. J. LILIEHOLM. 1999. The economic value of open space: a review and synthesis. *Environmental Management* 23:307–320.

- FILSON, G. C. 1996. Demographic and farm characteristic differences in Ontario farmers' views about sustainability policies. *Journal of Agricultural & Environmental Ethics* 9:165–180.
- FIRTH, H. M., S. M. WILLIAMS, G. P. HERBISON, AND R. O. MCGEE. 2007. Stress in New Zealand farmers. *Stress and Health* 23:51–58.
- FLEISCHNER, T. L. 1994. Ecological costs of livestock grazing in western North America. *Conservation Biology* 8:629–644.
- FORERO, L. 2002. Grass, grazers and tenure: a case study on the Shasta-Trinity National Forest [dissertation]. Berkeley, CA, USA: University of California. 171 p.
- FREILICH, J. E., J. M. EMLIN, J. J. DUDA, D. C. FREEMAN, AND P. J. CAFARO. 2003. Ecological effects of ranching: a six-point critique. *BioScience* 53:759–765.
- GALE, H. F. 2003a. Age-specific patterns of exit and entry in US farming, 1978–1997. *Review of Agricultural Economics* 25:168–186.
- GALE, I. 2003b. West Marin ranchers increasingly diversify. *Point Reyes Light* 10 April 2003. Available at: http://www.ptreyeslight.com/stories/apr10_03/ag_survey.html. Accessed 5 October 2007.
- GENTNER, B. J., AND J. A. TANAKA. 2002. Classifying federal public land grazing permittees. *Journal of Range Management* 55:2–11.
- GISBERT, L. B. 2005. Ageing and depopulation. Two basic problems for the revitalisation of the Sierra de Francia (Salamanca). *Boletín De La Asociación De Geógrafos Españoles* 40:135–151.
- GIUPPONI, C., M. RAMANZIN, E. STURARO, AND S. FUSER. 2006. Climate and land use changes, biodiversity and agri-environmental measures in the Belluno Province, Italy. *Environmental Science & Policy* 9:163–173.
- GOSNELL, H., J. H. HAGGERTY, AND W. R. TRAVIS. 2006. Ranchland ownership change in the Greater Yellowstone Ecosystem, 1990–2001. *Society and Natural Resources* 19:743–758.
- GOSNELL, H., AND W. R. TRAVIS. 2005. Ranchland ownership dynamics in the Rocky Mountain West. *Rangeland Ecology and Management* 58:191–198.
- HANSEN, A. J., R. RASKER, B. MAXWELL, J. J. ROTELLA, J. D. JOHNSON, A. W. PARMENTER, U. LANGNER, W. B. COHEN, R. L. LAWRENCE, AND M. P. V. KRASKA. 2002. Ecological causes and consequences of demographic change in the New West. *BioScience* 52:151–162.
- HANSEN, A. J., AND J. J. ROTELLA. 2005. Biophysical factors, land use, and species viability in and around nature reserves. *Conservation Biology* 16:1112–1122.
- HARGREAVE, T. 1993. The impact of a federal grazing fee increase on land use in El Dorado County, California [thesis]. Berkeley, CA, USA: Energy and Resources Group, University of California. 112 p.
- HOLMES, J. 2002. Diversity and change in Australia's rangelands: a post-productivist transition with a difference? *Transactions: Institute of British Geographers* 27:362–384.
- HULL, T., A. BRIGHT, AND G. WALLACE. 2006. Public attitudes about agriculture in Colorado. Denver, CO, USA: Colorado Department of Agriculture. Available at: <http://www.ag.state.co.us/mkt/AgInsights/Attitudes%20Toward%20Colorado%20Agriculture%202006%20Final%20Report.pdf>. Accessed 5 October 2007.
- HUNTSINGER, L., J. W. BARTOLOME, AND C. D'ANTONIO. 2007a. Grazing management on California's Mediterranean grasslands. In: M. R. Stromberg, J. D. Corbin, and C. D'Antonio [Eds.]. *California grasslands: ecology and management*. Berkeley, CA, USA: University of California Press. p. 233–253.
- HUNTSINGER, L., AND H. F. HEADY. 1988. Perceptions of the Vale Program. In: H. F. Heady [Ed.]. *The Vale rangeland rehabilitation program: an evaluation*. Portland, OR, USA: US Department of the Interior, Bureau of Land Management and US Department of Agriculture, Forest Service. Pacific Northwest Research Station Resource Bulletin PNW-RB-157. p. 103–133.
- HUNTSINGER, L., AND P. HOPKINSON. 1996. Viewpoint. Sustaining rangeland landscapes: a social and ecological process. *Journal of Range Management* 49:167–173.
- HUNTSINGER, L., M. JOHNSON, M. STAFFORD, AND J. FRIED. 2007b. A resurvey of oak woodland landowners: 1985, 1992, and 2004. In: A. Merenlender and B. Tiejie [Eds.]. *Proceedings of the Sixth Symposium on Oak Woodlands: California's Oaks, Today's Challenges, Tomorrow's Opportunities*; 9–11 October 2006; Santa Rosa, CA, USA. Santa Rosa, CA, USA: USDA-FS Gen Tech Report PSW-GTR-xxx. (In press).
- HUNTSINGER, L., A. SULAK, L. GWIN, AND T. PLIENINGER. 2004. Oak woodland ranchers in California and Spain: conservation and diversification. *Advances in Geocology* 37:309–326.
- JACKSON-SMITH, D., U. KREUTER, AND R. S. KRANNICH. 2005. Understanding the multidimensionality of property rights orientations: evidence from Utah and Texas ranchers. *Society and Natural Resources* 18:587–610.
- JOHANSSON, R. 2006. Working lands conservation programs. In: K. Wiebe and N. Gollehon [Eds.]. *Agricultural and resource indicators, 2006 Edition/EIB-16*. Washington, DC, USA: USDA Economic Research Service. Available at: <http://www.ers.usda.gov/publications/arei/eib16/>. Accessed 5 October 2007.
- JOHNSON, L. C., G. N. WALLACE, AND J. E. MITCHELL. 1997. Visitor perceptions of livestock grazing in 5 U.S. wilderness areas. *International Journal of Wilderness* 3:14–20.
- JOHNSON, S. G. 1998. Oaks at the edge: land use change in the woodlands or the central Sierra Nevada, California [dissertation]. Berkeley, CA, USA: University of California. 267 p.
- JONES, C. G., J. H. LAWTON, AND M. SHACHAK. 1994. Organisms as ecosystem engineers. *Oikos* 69:373–386.
- KAZAKOPOULOS, L., AND I. GIDARAKOU. 2003. Young women farm heads in Greek agriculture: entering farming through policy incentives. *Journal of Rural Studies* 19:397–410.
- KENNEDY, C. A., AND M. W. BRUNSON. 2007. Creating a culture of innovation in ranching: a study of outreach and cooperation in West Central Colorado. *Rangelands* 29:35–40.
- KNIGHT, R. L., W. C. GILBERT, AND E. MARSTON. 2002. Ranching west of the 100th meridian: culture, ecology, and economics. Washington, DC, USA: Island Press. 196 p.
- KNIGHT, R. L., G. N. WALLACE, AND W. E. RIEBSAME. 1994. Ranching the view: subdivisions vs. agriculture. *Conservation Biology* 9:459–461.
- KOTCHEN, M. J., AND S. M. POWERS. 2006. Explaining the appearance and success of voter referenda for open-space conservation. *Journal of Environmental Economics and Policy* 52:373–390.
- KREUTER, U. P., M. V. NAIR, D. JACKSON-SMITH, J. R. CONNER, AND J. E. JOHNSTON. 2006. Property rights orientations and rangeland management objectives: Texas, Utah and Colorado. *Rangeland Ecology and Management* 59:632–639.
- LAGRO, J. A. 1994. Population growth beyond the urban fringe: implications for rural land-use policy. *Landscape and Urban Planning* 28:143–158.
- LAMBERT, D. M., P. SULLIVAN, R. CLAASSEN, AND L. FOREMAN. 2007. Profiles of US farm households adopting conservation-compatible practices. *Land Use Policy* 24:72–88.
- LAND TRUST ALLIANCE. 2006. The 2005 national land trust census report. Available at: <http://www.lta.org/census/>. Accessed 5 October 2007.
- LASANTA, T., AND M. L. MARIN-YASELI. 2007. Effects of European common agricultural policy and regional policy on the socioeconomic development of the central Pyrenees, Spain. *Mountain Research and Development* 27:130–137.
- LENTH, B. A., R. L. KNIGHT, AND W. C. GILBERT. 2006. Conservation value of clustered housing developments. *Conservation Biology* 20:1445–1456.
- LIFFMANN, R. H., L. HUNTSINGER, AND L. C. FORERO. 2000. To ranch or not to ranch: home on the urban range? *Journal of Range Management* 53:362–370.
- MCDONALD, S. 2007. The next generation. *Malpai Borderlands Group Newsletter* October 2007.
- MCLEOD, D., J. WOIRHAYE, C. KRUSE, AND D. MENKHAUS. 1998. Private open space and public concerns. *Review of Agricultural Economics* 20:644–653.
- MAESTAS, J. D., R. L. KNIGHT, AND W. C. GILBERT. 2001. Biodiversity and land-use change in the American Mountain West. *Geographical Review* 91:509–524.
- MAESTAS, J. D., R. L. KNIGHT, AND W. C. GILBERT. 2003. Biodiversity across a rural land-use gradient. *Conservation Biology* 17:1425–1434.
- [MALT] MARIN AGRICULTURAL LAND TRUST. 2007. Food supply. Available at: <http://www.malt.org/preserve/food.html>. Accessed 5 October 2007.
- MARTY, J. T. 2005. Effects of cattle grazing on diversity in ephemeral wetlands. *Conservation Biology* 19:1626–1632.
- MITCHELL, J. E., G. N. WALLACE, AND M. D. WELLS. 1996. Visitor perception about cattle grazing on national forest land. *Journal of Range Management* 49:81–86.
- NEFF, J. C., R. L. REYNOLDS, J. BELNAP, AND P. LAMOTHE. 2005. Multi-decadal impacts of grazing on soil physical and biogeochemical properties in southeast Utah. *Ecological Applications* 15:87–95.
- NEILL, R., C. ASLAN, M. HUFFORD, J. PORT, J. SEXTON, AND T. WARING. 2007. Yellow starthistle symposium: the need for regional approaches to invasion management in Sierra Nevada foothill rangelands. *Noxious Times* 8:4–5.

- ONATE, J. J., J. E. MALO, F. SUÁREZ, AND B. PECO. 1998. Regional and environmental aspects in the implementation of Spanish agri-environmental schemes. *Journal of Environmental Management* 52:227–240.
- PANIAGUA, A. 2002. Urban–rural migration, tourism entrepreneurs and rural restructuring in Spain. *Tourism Geographies* 4:349–371.
- PEÑALOZA, L. 2000. The commodification of the American West: marketers' production of cultural meanings at the trade show. *Journal of Marketing* 64:82–109.
- PETERSON, R., AND D. L. COPPOCK. 2001. Economics and demographics constrain investment in Utah private grazing lands. *Journal of Range Management* 54:106–114.
- POTTER, C., AND M. LOBLEY. 1992. Aging and succession on family farms—the impact on decision-making and land-use. *Sociologia Ruralis* 32:317–334.
- PRITCHETT, L., R. L. KNIGHT, AND J. LEE [EDS.]. 2007. Home land: ranching and a West that works. Boulder, CO, USA: Johnson Books. 217 p.
- PYKE, C. R., AND J. MARTY. 2005. Cattle grazing mediates climate change impacts on ephemeral wetlands. *Conservation Biology* 19:1619–1625.
- QUIVIRA COALITION. 2007. More about the New Ranch Network. Available at: http://newranch.net/About_the_NRN/index.html. Accessed 12 November 2007.
- RESNIK, J., G. WALLACE, M. BRUNSON, AND J. MITCHELL. 2006. Open spaces, working places. *Rangelands* 28:4–9.
- RIEBSAME, W. [ED.]. 1997. Atlas of the new West. New York, NY, USA: W. W. Norton. 192 p.
- RIEBSAME, W. E., H. GOSNELL, AND D. M. THEOBALD. 1996. Land use and landscape change in the Colorado mountains. I: Theory, scale, and pattern. *Mountain Research and Development* 16:395–405.
- ROBINSON, G. M. 2006. Ontario's environmental farm plan: evaluation and research agenda. *Geoforum* 37:859–873.
- ROSANAN, L. 1997. Preserving working ranches in the West. Tucson, AZ, USA: Sonoran Institute. 53 p.
- ROWE, H. I., E. T. BARTLETT, AND L. E. SWANSON, JR. 2001. Ranching motivations in two Colorado counties. *Journal of Range Management* 54:314–321.
- SAYRE, N. F. 2006. Working wilderness: the Malpai Borderlands Group story and the future of the Western range. Tucson, AZ, USA: Rio Nuevo Publishers. 128 p.
- SCOTT, J. M., F. W. DAVIS, R. G. MCGHIE, R. G. WRIGHT, C. GROVES, AND J. ESTES. 2001. Nature reserves: do they capture the full range of America's biological diversity? *Ecological Applications* 11:999–1007.
- SHUMWAY, J., AND S. OTTERSTROM. 2001. Spatial patterns of migration and income change in the Mountain West: the dominance of service-based, amenity-rich counties. *Professional Geographer* 53:492–502.
- SILBERT, S., G. CHANLER, AND G. P. NABHAN. 2006. Five ways to value working landscapes of the West. Flagstaff, AZ, USA: Center for Sustainable Environments, Northern Arizona University. 35 p.
- SMILES, P. J. 1997. Socio-economic change and rural morale in South Australia, 1982–1993. *Journal of Rural Studies* 13:19–42.
- SMITH, A. H., AND W. E. MARTIN. 1972. Socioeconomic behavior of cattle ranchers, with implications for rural community development in the West. *American Journal of Agricultural Economics* 54:217–225.
- SOKOLOV, A. 2003. Are agricultural easement programs working? A national view of agricultural easement programs: measuring success in protecting farmland, Report 4. Davis, CA, USA: American Farmland Trust and the Agricultural Issues Center, University of California. Available at: <http://www.farmland.org/resources/reports/NationalView.asp>. Accessed 5 October 2007.
- SREDL, M. J., AND L. S. SAYLOR. 1998. Conservation and management zones and the role of earthen cattle tanks in conserving Arizona leopard frogs on large landscapes. In: J. M. Feller and D. S. Strouse [EDS.]. Proceedings of the Symposium on Environmental, Economic, and Legal Issues Related to Rangeland Water Developments; 13–15 November 1997; Tempe, AZ, USA. Tempe, AZ, USA: Arizona State University. p. 211–223.
- STARRS, P. F. 1998. Let the cowboy ride: cattle ranching in the American West. Baltimore, MD, USA: Johns Hopkins University Press. 384 p.
- STARRS, P. F. 2002. Ranching: an old way of life in the new West. In: R. L. Knight, W. C. Gilgert, and E. Marston [EDS.]. Ranching West of the 100th meridian: culture, ecology, and economics. Washington, DC, USA: Island Press. p. 3–23.
- SULAK, A., AND L. HUNTSINGER. 2002. Sierra Nevada grazing in transition: the role of Forest Service grazing in the foothill ranches of California. A report to the Sierra Nevada Alliance, the California Cattlemen's Association, and the California Rangeland Trust. Available at: <http://www.sierranevadalliance.org/publications/publication.shtml?type=pgm02>. Accessed 5 October 2007.
- SULAK, A., AND L. HUNTSINGER. 2007. Public land grazing in California: untapped conservation potential for private lands? *Rangelands* 29:9–12.
- SULLINS, M. J., D. M. THEOBALD, J. R. JONES, AND L. M. BURGESS. 2002. Lay of the land: ranch land and ranching. In: R. L. Knight, W. C. Gilgert, and E. Marston [EDS.]. Ranching west of the 100th meridian: culture, ecology, and economics. Washington, DC, USA: Island Press. p. 25–31.
- TALBERT, C., R. L. KNIGHT, AND J. MITCHELL. 2007. Private ranch lands and public-land grazing in the southern Rocky Mountains. *Rangelands* 29:5–8.
- TANAKA, J. A., L. A. TORELL, AND N. R. RIMBEY. 2005. Who are public land ranchers and why are they out there? *Western Economics Forum* 4:14–20.
- TAVERNIER, E. A., AND V. TOLOMEO. 2004. Farm typology and sustainable agriculture: does size matter? *Journal of Sustainable Agriculture* 24:33–46.
- TAYLOR, J. E. 2004. The many lives of the new West. *Western Historical Quarterly* 35:141–166.
- THE NATURE CONSERVANCY. 2007. The Nature Conservancy celebrates nine years in Sheridan County. Available at: <http://www.nature.org/wherework/northamerica/states/wyoming/press/press3162.html>. Accessed 12 November 2007.
- THEOBALD, D. M. 2000. Fragmentation by inholdings and exurban development. In: R. L. Knight, E. H. Smith, S. W. Buskirk, W. H. Romme, and W. L. Baker [EDS.]. Forest fragmentation in the southern Rocky Mountains. Boulder, CO, USA: University Press of Colorado. p. 155–174.
- TORELL, L. A., AND S. A. BAILEY. 2000. Is the profit motive an important determinant of grazing land use and rancher motives? *Journal of Agricultural and Resource Economics* 25:725–725.
- [USDI-FWS] UNITED STATES DEPARTMENT OF THE INTERIOR-FISH AND WILDLIFE SERVICE. 2006. Designation of critical habitat for the California red-legged frog, and special rule exemption associated with final listing for existing routine ranching activities, final rule. Available at: <http://ecos.fws.gov/speciesProfile/SpeciesReport.do?spcode=D02D> Accessed 5 October 2007.
- VAN KOOTEN, G. C., R. THOMSEN, T. G. HOBBY, AND A. J. EAGLE. 2006. Social dilemmas and public range management in Nevada. *Ecological Economics* 57:709–723.
- WARREN, S. D., AND D. J. ELDRIDGE. 2001. Biological soil crusts and livestock in arid ecosystems: are they compatible? In: J. Belnap and O. L. Lange [EDS.]. Biological soil crusts: structure, function and management. Berlin, Germany: Springer-Verlag. p. 401–416.
- WHITE, R., AND P. N. LIMERICK [EDS.]. 1994. The frontier in American culture. Chicago, IL, USA: Newberry Library. 116 p.
- WILCOVE, D., M. BEAN, R. BONNIE, AND M. McMILLAN. 1996. Rebuilding the ark: toward a more effective endangered species act for private land. Available at: http://www.environmentaldefense.org/documents/483_Rebuilding%20the%20Ark.htm. Accessed 5 October 2007.
- WILD, M. T., AND P. N. JONES. 1988. Rural suburbanisation and village expansion in the Rhine Rift valley: a cross-frontier comparison. *Geografiska Annaler* 70B:275–290.
- WILKINSON, R., N. BARR, AND K. KARUNARATNE. 2002. “The kids don't want to take over the farm”: what's happening to the demographics of Victoria's wool industry? *Wool Technology and Sheep Breeding* 50:295–301.
- WILMOT, S., AND M. W. BRUNSON. 2005. Conservation attitudes of rural landowners near Fort Hood, Texas: final report to The Nature Conservancy, February. Logan, UT, USA: Utah State University. 56 p.
- WULFHORST, J. D., N. RIMBEY, AND T. DARDEN. 2006. Sharing the rangelands, competing for sense of place. *American Behavioral Scientist* 50:166–186.