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Rethinking property rights: comparative analysis of conservation easements for wildlife conservation

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SUMMARY

Conservation easements (or conservation covenants) are commonly conceptualized as acquisitions of sticks in a 'bundle of rights' and are increasingly implemented for wildlife conservation on private lands. This research asks: (1) What are the possibilities and limitations of the conservation easement approach to wildlife conservation in contrasting rural and periurban regions? and (2) How does analysis of conservation easements differ when examining property as a bundle of rights or alternative metaphors? These questions were addressed through document analysis, interviews and GIS mapping in two regions where The Nature Conservancy deployed conservation easements for wildlife habitat: rural Lassen Foothills and periurban Tenaja Corridor, USA. Splitting the bundle allowed for site and region-specific easements with differences in permitted housing densities, land management and hunting. Easements focused on restricted rights rather than affirmative duties. The challenges of habitat connectivity in the fragmented Tenaja Corridor revealed the limits of parcel-based acquisition. Analysts and conservation practitioners should rethink the bundle of rights concept of property, considering a bundle of duties, powers and owners within a broader web of social and ecological interests, to understand the role of conservation acquisitions in contrasting landscape contexts.

Keywords: conservation easements, conservation covenants, development, land conservation, land trusts, private lands, property concepts, property rights, wildlife habitat, urbanization

INTRODUCTION

Property is central to environmental conservation (Naughton-Treves & Sanderson 1995). Fundamental concepts of property rights and responsibilities underlie conservation approaches, including acquisition, regulation and incentives (Bromley & Hodge 1990). The view of property as separable sticks in a 'bundle of rights' is the dominant legal metaphor for property in common law countries. However, limitations of the bundle of rights concept have important implications for conservation tools (Goldstein 1997; Heasley 2005). Alternative metaphors of property view it as a bundle of duties, powers or owners, or a web of interests. This research examines the relationship between property concepts and the analysis of property institutions in practice (Macpherson 1978), focusing on conservation easements (or conservation covenants) created to conserve wildlife habitat in contrasting rural and periurban regions.

The canonical bundle of rights metaphor describes property as a set of separable legal and social relations, as opposed to an owner's dominion over a thing (Macpherson 1978). The reconceptualization of property as a bundle of rights emerged with industrialization and the rise of the administrative state to allow for abstract wealth accumulation and government regulation of private property (Arnold 2002). Although he did not use the phrase, Hohfeld (1913) is credited with the concept for his analytical framework of property rights, duties, powers and immunities. The metaphor has taken on a life of its own (see for example Rose 1998) as a phrase that simplifies the complex ideas associated with its genesis (Penner 1996). The common usage definition of the bundle of rights imagines owners' rights as sticks in a bundle of firewood (Arnold 2002). An article for private landowners explains, 'each stick represents a distinct and separate right, which may be the right to use the real estate, to sell it, to lease it, to enter it... The rights in the bundle, subject to government limitations and private restrictions, can be sold, leased, transferred, or otherwise disposed of individually' (Barber 2012).

Conservation easements are often described as splitting the bundle of rights. In a conservation easement, a government or non-profit conservation organization acquires partial property rights from a landowner to restrict land uses such as building, mining or timber harvesting (Daniels 1991; Cheever 1995). The conservation easement holder is tasked with enforcing these restrictions, typically in perpetuity (Merenlender *et al.* 2004). Conservation easements vary considerably, from scenic open space easements that prevent development, to wildlife habitat easements that provide for ecosystem management. Conservation easements are increasingly popular internationally, including in North America, Latin America, Europe and Australia (Kabii & Horwitz 2006; Rissman *et al.* 2007). They arose from a private property rights ideology that promotes voluntary landowner choices and compensation for restricted use rights (Lippmann

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2006). Conservation organizations have gravitated toward conservation easements due to perceptions that fee simple is too expensive and regulations are too politically contentious (Merenlender *et al.* 2004).

Private lands are critical for wildlife habitat and connectivity (Scott *et al.* 2001; Hilty & Merenlender 2003) and acquiring conservation easements is one important approach to species conservation (Fairfax *et al.* 2005). Wildlife refers to terrestrial and aquatic free-ranging vertebrate and invertebrate animals. Wildlife use is restricted by overlapping legal, regulatory and contractual rules, which are often contested in conservation projects (Naughton-Treves & Sanderson 1995). Two challenges of assigning property rights to wildlife are fugitiveness (mobility, elusiveness) and spatial extent greater than ownership boundaries (Lueck 1995).

The bundle of rights concept has implications for analysis of conservation easements as a wildlife conservation tool. Importantly, the bundle of rights emphasizes landowner rights. The difference between a bundle of rights and a 'bundle of duties' or obligations affects societal expectations of property owners (Bromley & Hodge 1990; Rose 1994). Some argue the bundle of rights concept promotes an overly fragmented profusion of property rights that complicates a social values or holistic approach to land management (Arnold 2002). Sociologists and others recommend analysis of a 'bundle of powers' that examines access to resource benefits beyond formal legal rights (Ribot & Peluso 2003). Some suggest a 'bundle of owners' to represent diverse public, state, community and individual interests (Geisler & Daneker 2000). Finally, individual bundles de-emphasize social and ecological relationships, including the connections among parcels, which may be better reflected in a 'web of interests' (Arnold 2002).

Property rights arrangements such as conservation easements are likely to vary with landscape context. In rural regions, conservation easements are likely to be on larger properties, limit development to low densities, and allow some grazing, timber harvesting or agriculture. Periurban conservation easements may permit greater development densities, but include more specific land-use terms. Conservation easements are more cost-effective in rural areas, as a proportion of a property's market value (Newburn *et al.* 2005). Landowner motivations differ with regional context and personal connection to landholdings (Kabii & Horwitz 2006). The social and political context also varies, since urbanized regions may have denser networks of conservation and development organizations (Hardy & Koontz 2010).

This research asks how conservation easements restrict development, land use and wildlife use in contrasting rural and periurban regions, to conserve wildlife. Second, it examines how the analysis of conservation easements for habitat conservation differs when examining property as a bundle of rights or alternatively as a bundle of duties, powers or owners, or a web of interests. To investigate the possibilities and limitations of conservation easements for wildlife conservation, I undertook a comparative case study of The Nature Conservancy's (TNC) conservation easements in a rural ranching region and a fragmented periurban region. Three aspects of the bundle of rights concept are of particular interest in this analysis: divisibility of property, emphasis on rights rather than duties or powers, and focus on individual bundles compared with a web or landscape of interest.

METHODS

This research compares two case studies in which conservation easements were created by TNC to protect wildlife and wildlife habitat. The two cases were selected to characterize well-developed conservation programmes in regions of contrasting land use intensity: the rural Lassen Foothills in northern California and the periurban Tenaja Corridor in southern California (Yin 2009). TNC is the largest non-profit conservation easement holder in the USA and is increasingly acquiring land internationally.

Analysing conservation easements and other TNC documents allowed me to complete an extensive questionnaire (Appendix 1, see supplementary material at Journals.cambridge.org/ENC) for each of the 24 Lassen Foothills and seven Tenaja Corridor conservation easements. TNC documents included a narrative description of the property's history and monitoring by TNC staff. Based on earlier surveys of conservation easements (Rissman 2010), the questionnaire focused on conservation easement monitoring and terms related to development, fragmentation, management of wildlife habitat, and wildlife use through hunting, trapping and fishing. Coding of easement terms from the questionnaire was coordinated between two researchers through consistent training and periodic coding comparisons. Maps produced with a geographic information system (ArcGIS) revealed the relative importance of individual conservation easements and fee simple acquisitions in creating wildlife habitat corridors.

For further information on the context of property, development and wildlife resources, I interviewed 19 TNC staff members, including real estate and science staff in Lassen and Tenaja, along with project managers, scientists and attorneys throughout California. I also interviewed representatives of 10 other non-profit and government conservation agencies active in the two regions, selected to include local land trusts, public land management agencies and environmental advocacy groups. The total interview response rate was 94% (29 of 31). Interviews were semi-structured, typically one hour in length, and recorded over the phone or in staff offices between 2008 and 2010 (Appendix 2, see supplementary material at Journals.cambridge.org/ENC). I transcribed and coded interview content in Microsoft Word into the following themes: wildlife habitat and direct wildlife use, property rights and responsibilities, and role of the property in the landscape (Babbie 2007). In addition, local visits, interviews with scientists and realtors, and a review of local media coverage and academic and practitioner literatures

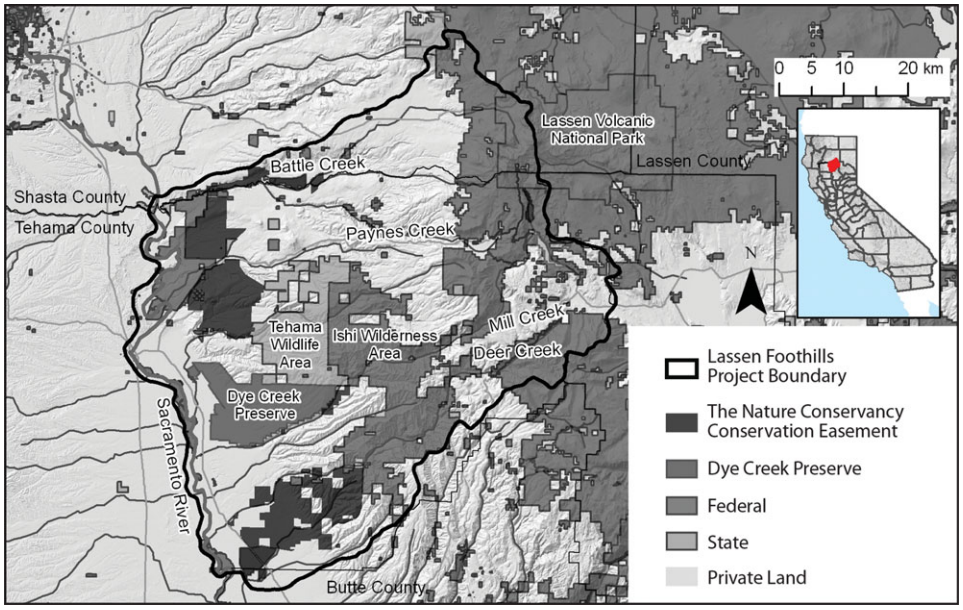

Figure 1 (Colour online) Lassen Foothills, rural northern California.

informed the analysis of conservation easements in their regional contexts.

Study areas

Lassen Foothills, northern California, USA

In the Lassen Foothills, TNC aims to protect one of the largest unfragmented landscapes in California (Fig. 1). The Lassen Foothills project area covers over 364 218 ha and extends from the peak of Mount Lassen to the Sacramento River in the Central Valley. TNC's goal in the Lassen Foothills is 'to work with private landowners, local organizations, and the community to ensure the sustainability and economic viability of private land uses and the ongoing health of the area's plants and animals' (The Nature Conservancy 2011).

TNC relies primarily on the purchase of conservation easements in the Lassen Foothills. TNC has acquired conservation easements on privately-owned cattle ranches and smaller valley floor properties along important riparian corridors which support anadromous fish. TNC established 22 conservation easements over 37 083 ha of land between 1997 and 2010 with public and private funding, and continues to acquire conservation easements and some fee simple lands in the area. A typical conservation easement in this region protects a large cattle ranch and has a purpose to 'preserve, protect, enhance and restore in perpetuity the Conservation Values of the Property' such as 'blue oak woodlands, unfragmented open space, corridors for the unimpaired passage of wildlife, and natural communities that provide habitat for native wildlife species, including spring-run Chinook salmon, the Tehama deer herd, foothill yellow-legged frogs, raptors, and waterfowl'.

Tenaja Corridor, southern California, USA

TNC established the Tenaja Corridor in western Riverside County, California to link the Santa Rosa Plateau Ecological Reserve with the Cleveland National Forest (Fig. 2). The corridor has become one of TNC's most fragmented project areas, with many 4–10 ha parcels. TNC purchased initial parcels of the Santa Rosa Plateau Ecological Reserve in 1984, and the reserve is now managed through a multiagency partnership. Conservation groups became concerned that fragmentation would isolate the Santa Rosa Plateau from nearby Cleveland National Forest. One of the major barriers to conservation acquisitions has been the existence of road and sewage services that require payments from landowners to the Tenaja Community Services District, which was formed in 1985 (Riverside Local Agency Formation Commission 2006). Properties here are marketed as 'custom dream homes' surrounded by reserve lands in a 'luxury community of estate homes, ranches, and groves' (Sturm 2010). The 6-km Tenaja Corridor plan resulted from a conservation planning process aimed at protecting habitat and connectivity for a suite of native species and natural communities (Sanjayan & Crooks 2005). Only seven properties within the Tenaja Corridor were conserved through TNC conservation easements.

A typical Tenaja Corridor conservation easement states that it protects 'significant natural, ecological, and aesthetic values' including 'habitats essential to maintaining various natural communities of sensitive, rare, and/or endangered plant and animal species'. Half the conservation easements specifically mention wildlife connectivity as a goal. A multispecies habitat conservation plan (MSHCP) across western Riverside County, including the Tenaja Corridor, was finalized in 2003 to coordinate the protection of endangered species while accommodating development and funding land acquisition.

RESULTS

Splitting the bundle of rights: wildlife habitat and direct wildlife use

Conservation easement terms reveal differences in how conservation restrictions are tailored for rural and periurban

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Table 1 Comparison of the The Nature Conservancy's Lassen Foothills and Tenaja Corridor conservation easements (CEs) and landscape contexts.

Analytical categories		*Rural Lassen Foothills*	*Periurban Tenaja Corridor*
Case study characteristics	Length of corridor	*c.*70 km	6 km
	Number of CEs	22	7
	Median CE size	216 ha	4 ha
	CE cost	Cost of CE substantially less than cost of land	Cost of CE only slightly less than cost of land
Conservation easement rights and restrictions	Housing density CEs allow (median)	1 house/ 225 ha	1 house/ 4 ha
	Housing terms	Building envelopes for residence, ranch	Design specifications for outdoor lighting, building colour
	Hunting terms	Sustainable hunting permitted including selective control of depredating predators	No hunting permitted except for non-native species
Duties, powers and owners	Monitoring of CE terms	TNC monitored CEs regularly; no wildlife-related violations	TNC monitored CEs regularly; no wildlife-related violations
	Landowner or TNC land management obligations in CEs	None	None
	Financial duties of property ownership	Property taxes typical of large ranches	Service district fees to fund utilities, even if properties remain undeveloped
Landscape context	Corridor completeness	Corridor links Sacramento River to Mt Lassen	Corridor incomplete
	Regulatory context	County plan, zoning is 64-ha minimum lot sizes	County approved small-lot development; later an MSHCP went into effect

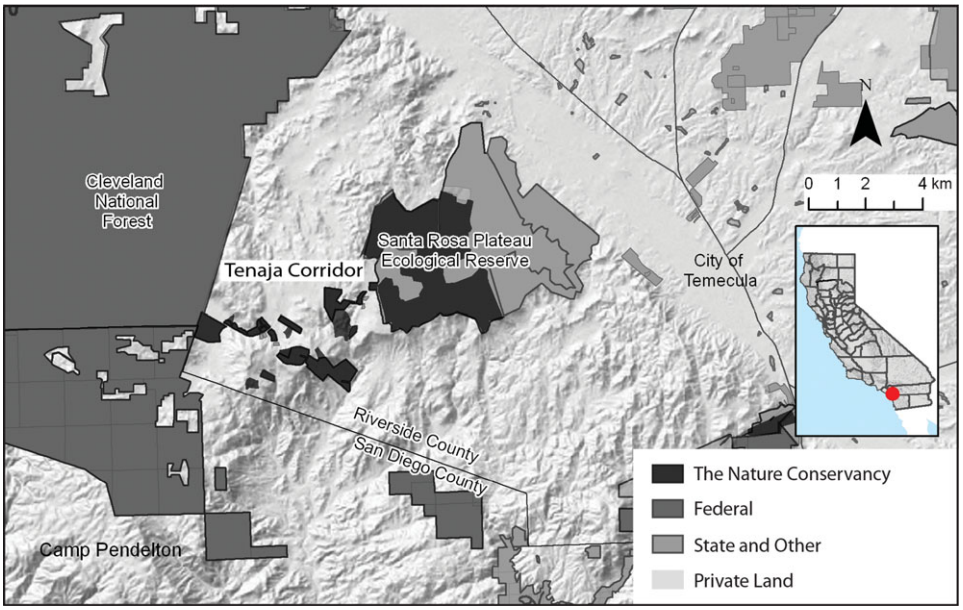

Figure 2 (Colour online) Tenaja Corridor, periurban southern California.

regions (Table 1). Housing was considered the primary threat to wildlife habitat in both regions, but at different densities. In the Lassen Foothills, most conservation easements allowed each large ranch to have a small number of new houses, barns, outbuildings and roads. Building envelopes constrained the size of future development, and there were some restrictions on new paved roads. In contrast, Tenaja Corridor properties were small 2–10 ha parcels that typically allowed a sizable residence up to 460 m^2 with design restrictions on colour and outdoor lighting to reduce wildlife impacts. Some Tenaja Corridor easements were perceived by interviewees as insufficiently restrictive. For instance, two 4-ha properties were each divided into a 2-ha undeveloped site and a 2-ha designated site that allowed for 900 m^2 of buildings, horse corrals and other uses. There is a time lag between legal agreements and land-use outcomes, as most of the

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houses permitted by the easements have not yet been built.

In the Tenaja Corridor, original TNC conservation planning maps optimistically envisioned a housing pattern of sub-hectare clearings surrounded by chaparral and oak woodlands viable for mountain lions and other animals. However, landowners preferred to remove considerably more vegetation around their houses due to concerns about wildfire, mountain lions, rattlesnakes and other threats. This led one local TNC staff member to conclude that shared partial property rights were not compatible in the Tenaja Corridor and TNC should focus on fee simple acquisition where 'we get full control (of the conserved area), and they get full control (of the house and surrounds)'. TNC also found that conservation easements cost 70–90% of the entire property value, so there was little financial incentive to purchase partial property rights.

Different types of detailed restrictions were designed for ecosystem management in each region. In the Lassen Foothills, conservation easements were designed to reflect rather than shape local norms related to grazing, hunting and predator control. Ranching was viewed by TNC as compatible with wildlife habitat. To prevent overgrazing, most easements stipulated a minimum residual dry matter left on the ground at the end of the grazing season. Habitat management terms provided for riparian fencing, vernal pool protection, management of invasive plants, use of prescribed fire and use of biocides. One of the threats to wildlife movement in the Tenaja Corridor, but not the Lassen Foothills, was perimeter fencing around a property to protect tree groves or allow horses to roam. Tenaja Corridor easements required wildlife-friendly fencing; on several properties a perimeter fence was only permitted if it was split rail or wire fencing with no more than three rails or strands spaced at least 30 cm apart. In a restriction unlikely to have been acceptable to rural ranch owners, Tenaja Corridor easements did not allow 'domestic dogs and cats to run free beyond the control' of the landowner. Lassen Foothills easements restricted the export and sale of water off-property to retain in-stream flow for anadromous fish.

Hunting and fishing restrictions also varied between the rural and periurban region. In the Lassen Foothills, many landowners valued the hunting and fishing opportunities on their properties and a few purchased the land primarily for this purpose. Many Lassen Foothills easements permitted hunting as long as it was legal under state law, did not 'significantly deplete wildlife resources' or was conducted 'in a manner consistent with the protection of the Conservation Values of this Conservation Easement'. These requirements placed the burden of proof on the easement holder to identify significant depletions and inconsistency with wildlife protection goals. In contrast, all Tenaja Corridor easements prohibited hunting except for non-native species.

Some Lassen Foothills conservation easements limited the number of fishing rods per day for salmon and steelhead protection. TNC staff indicated these restrictions were included because of concerns that state fishing regulations did not provide sufficient protection in areas of intensive use. For example, one property with a backcountry commercial trout fishing cabin had a maximum limit of six rods per day in one area, four rods per day in another, and a total maximum limit of 16 rods per day. These limits on rods per day were rare among TNC's easements, but indicate the potential for conservation easements to restrict fishing directly.

Lassen Foothills easements also provided a compromise with landowners on predator control, consistent with local culture. Most easements stated that 'control of predatory and problem animals shall use selective control techniques, limited in their effectiveness to specific animals which have caused damage to livestock and other property, or which degrade multiple conservation values in the easement, or as necessary or appropriate to protect pasture lands'. No native predator control was permitted in the Tenaja Corridor. Unlike in the Lassen Foothills, no exceptions were made for predators that damaged property. As one TNC staff person indicated, TNC was conscious of the need to define specific partial property rights because 'the terms need to reflect something that can be appraised, measured, and a value put to' in order to ensure that TNC paid a fair market value for the conservation easement.

Bundles of duties, powers, owners: social relations of property

Analysis of the social relations of conservation easements revealed how a focus on rights can obscure the importance of monitoring and enforcement, the role of the public interest, and property-related duties and responsibilities. In theory, monitoring visits should provide an indication of an easement's conservation outcomes. In both the Lassen Foothills and Tenaja Corridor, all properties were visited annually by a TNC staff member to ensure that conservation easement terms were not violated. TNC's monitoring identified no violations related to wildlife conservation in the Lassen Foothills in any year and in the Tenaja Corridor for years where information was available (2007–2009). However, TNC staff suggested that while they could monitor some aspects of land use, day-to-day wildlife use such as landowner and third-party hunting and fishing, and restrictions such as no pets off leash, were nearly impossible to monitor. Nonetheless, these annual monitoring visits established social expectations and gave TNC staff an opportunity to informally obtain information about landowners' wildlife sightings.

Conservation easements also provided the social relationships that resulted in increased ecological monitoring and ecosystem management beyond what was legally required. One TNC ecologist described the relationship between compliance and ecological monitoring: 'two things are going on. One is if something is out of compliance; another is whether a species is experiencing difficulties that have little to do with the active control of the owner'. To investigate the latter, TNC was successful in generating funding to enlist researchers in monitoring bird and plant diversity and

abundance on several conservation easements in the Lassen Foothills. Social relations also led to invasive species removal, restoration and education for new landowners. In the Tenaja Corridor, education efforts to teach people how to live with mountain lions have been ongoing, but one mountain lion was illegally shot in the Corridor for attacking a horse (although not necessarily on a conserved property).

In both cases, TNC negotiated the conservation easement directly with landowners, compensating them for foregone development and land-use rights. In both cases the easements restricted development to a greater extent than local zoning restrictions. While diverse other parties including the general public and local communities were often recognized in easement language as the primary beneficiary of the conservation easement, these beneficiaries generally had little representation in the negotiation of the easement terms or their ongoing monitoring and enforcement. The two-party acquisition negotiation emphasizes landowner or seller control and reifies the pre-eminence of landowner rights.

Property involves duties and responsibilities in addition to rights. Yet, in both cases, almost no easement terms imposed affirmative obligations on either the landowner or the easement holder. For instance, TNC typically acquired the right but not the obligation to actively manage and restore habitat on the properties. One financial advantage of conservation easements over fee simple acquisition for TNC is that the landowner bears the costs of land management. The resulting agreements did not obligate either party to manage specifically for wildlife habitat.

Landowner duties in the broader social landscape were particularly significant in the Tenaja Corridor. Tenaja landowners had a shared social responsibility to pay for water and road infrastructure regardless of whether their properties were developed. These ongoing service district fees were a major financial barrier to conservation acquisitions. TNC staff expressed the concern that ceasing to pay the fees could create resentment among landowners toward the Corridor. Staff from a local land trust and a local government agency indicated that some landowners purchased Tenaja Corridor properties speculatively for development: 'people really look at the value of land based on the development rights. There are not a lot of long term ownerships, family farms or family ranches, where there's a connection to the land'. Thus landowner motivations and neighbourhood financial obligations inhibited conservation acquisitions in the Tenaja Corridor. In the Lassen Foothills, the conservation value of a property helped generate its financial investment value.

Web of interests: wildlife conservation across the social and ecological landscape

While the bundle of rights emphasizes the unit of the bundle or parcel, the two cases reveal the challenge of linking properties across larger landscapes. In the Lassen Foothills, adjacent conservation easements have protected a corridor along Deer Creek from the Central Valley to the state-owned Ishi Wilderness area and higher elevation federal lands. Given relatively low development pressures, there may be time and opportunity to acquire additional conservation easements to strengthen the conserved corridor between the Sacramento River and the mountainous Lassen Volcanic National Park (Byrd *et al.* 2009). Even if the conservation easements were not in place, development would be restricted by Tehama County's general plan (Tehama County 2009). The plan restricts development in foothill grazing lands to 65-ha minimum lot sizes, but this is much smaller than the existing ranches, and TNC staff were concerned that variances could be obtained for even greater densities. In addition to upland connectivity, TNC is focused on aquatic connectivity for endangered anadromous fish. TNC has started to purchase water rights and seek mechanisms to increase stream flow, since conservation easement restrictions on overfishing, development, bank alteration and gravel mining are not sufficient to restore depleted fish populations.

In contrast, the trend in the Tenaja Corridor is toward increasing fragmentation in an already-fragmented landscape. When Riverside County approved fragmentation of the Tenaja Valley into 2–16 ha parcels, TNC estimated that hundreds of parcels would be needed for connectivity success (Morrison & Boyce 2008). The high land values and pace of fragmentation and development have challenged conservation efforts such that over a decade of effort has not yet produced a 'complete' corridor. Since properties were speculatively purchased by landowners, few were interested in donating easements. Indeed, TNC scientists have described the Tenaja Corridor as a 'precautionary tale' for the challenges of protecting corridors in highly fragmented landscapes (Morrison & Boyce 2008). The failure of property-by-property restrictions to add up to a viable corridor has been blamed on high land prices where water and infrastructure were already in place on each legal parcel (Sanjayan & Crooks 2005). Given the inadequacy of voluntary acquisition for keeping pace with fragmentation in this landscape, TNC scientists hope that regulatory plans such as the Western Riverside County MSHCP under the Endangered Species Act (US Government 2011) will enhance land protection efforts in the corridor (Morrison & Boyce 2008).

DISCUSSION

Comparison of the rural Lassen Foothills and periurban Tenaja Corridor allows for reflection on the strengths and limitations of conservation easements and the analysis of property as a bundle of rights, duties, powers or owners, or web of interests. Both cases reveal that divisibility of the bundle allows for site-specific tailoring of conservation approaches, but that partial property acquired parcel by parcel may not be sufficient for terrestrial and aquatic wildlife habitat. These limits are particularly apparent in the fragmented Tenaja Corridor. Comparing the rural and periurban cases demonstrates how analysts could look beyond individual

bundles to examine how landowner rights are embedded in broader social relations and landscape contexts. In the rural Lassen Foothills, the web of interests included conserved ranches and adjacent public lands, large-parcel zoning and aquatic habitat, while conservation in the Tenaja Corridor was challenged by fragmentation, service district fees and speculation-driven investment.

Divisions of the bundle of rights can be tailored as appropriate for local environmental conditions and conservation goals (Cheever 2001). Lassen Foothills conservation easement terms reflected land use on large cattle ranches, while Tenaja Corridor conservation easements had more specific restrictions on building design, pets and predator control. In comparison with one-size-fits-all regulation, site-specific agreements are extremely flexible to local conditions and incorporate a variety of restrictions on buildings and roads, vegetation management and direct use of wildlife. Finely partitioning property rights for particular rural or periurban places requires conservation easement negotiators to account for each property's unique characteristics. Commodification of partial property rights raises questions about potential disconnects between market value, driven by development and resource use rights, and conservation value, driven by wildlife habitat and other environmental benefits.

These cases reveal that a full understanding of property requires a shift from consideration of individual bundles of rights to alternative concepts of property as bundles of duties and powers within a broader web of social and ecological interests. A deeper understanding of property as encompassing rights, duties, and powers held by owners and society was central to Hohfeld's early ideas (Hohfeld 1913), but is often lost in the simplified retelling of the bundle of rights metaphor. Legal restrictions alone do not account for conservation outcomes. At the property scale, conservation easements are likely to be most effective when terms can be monitored and enforced, and therefore most terms were related to structural development and habitat management. Conservation easements addressed wildlife use directly, even though terms such as hunting, fishing and pets off leash generally cannot be directly monitored. This disjuncture is central to the limits of land acquisition to protect biodiversity: habitat is necessary but not sufficient for species persistence. Habitat management cannot be reduced to legal terms (Rissman 2010), and the ecological monitoring necessary to evaluate effectiveness is often limited (Kiesecker *et al.* 2007).

Conservation easements compensate landowners and focus almost exclusively on landowner and holder rights, as opposed to duties or obligations. This is consistent with the critique that the bundle of rights focuses disproportionately on rights over duties or privileges (Rose 1994). Property rights often translate into 'presumptive entitlements in the policy arena', requiring subsidies or incentives to restrict land use for environmental or other social benefit (Bromley & Hodge 1990). Because property rights evolve with society and rely on state authority to enforce and validate their existence, private property is an institution for achieving social goals (Freyfogle 2007). The focus on rights is problematic because payment for conservation easements or other types of ecosystem services runs the risk of eroding a social values approach to land and property (Fairfax *et al.* 2005; Freyfogle 2007). The privileged position of landowners means that landowner motivations are critical for conservation efforts (Kabii & Horwitz 2006). Furthermore societal property duties associated with development, such as service district fees in the Tenaja case, can severely curtail the viability of conservation acquisitions.

The spatial scale of wildlife movement, almost always larger than ownership boundaries, requires a regional approach and speaks to the importance of coordinating a web of interests including non-profit, local, state and federal governance authorities (Hilty *et al.* 2006). In the Tenaja Corridor, individual acquisitions could not achieve habitat connectivity goals in the face of rapid urbanization threats. While the seemingly apolitical approach of acquiring property rights has appealed to non-profit land trusts (Feldman & Jonas 2000), it does not harness the considerable power of regulatory authorities to enact a large-scale conservation vision. The Tenaja Corridor demonstrates that public and non-profit actors cannot afford to buy it all, and fall back to a regulatory approach after seeing acquisition efforts stymied. This supports Cheever's (2001) contention that 'property based protection of the land we own must be coupled with regulatory protection of the appurtenant common pool resources. Over time we can develop a blended system of property and regulation to protect wildlife habitat'.

In the Lassen Foothills, the land-use plan and low projected population growth kept the limits of acquisition from being as apparent and extended the time horizon for linking landscapes. Given the low level of threat it is unclear how the landscape would differ without the significant investment in conservation easements, but there may be sufficient time to protect a robust unfragmented corridor. These cases support the increasing calls for prioritizing moderately-threatened moderately-priced land over inexpensive unthreatened land or expensive highly-fragmented land (Newburn *et al.* 2005). The Tenaja Corridor demonstrates the difficulty of remaining in that happy medium.

Some suggest that the bundle of rights view of property is consistent with ecosystem management since it may be multijurisdictional, collaborative and move away from 'walls of rights' established by property conceived as absolute dominion (Nedelsky 1990; Hurley *et al.* 2002). Hurley *et al.* (2002) argued that conservation easements embody this broader understanding of property and may better reflect the complexity of ecological systems. However, this comparative case study suggests that while the bundle of rights has some advantages, it does not promote a collaborative approach to ecosystem management across property boundaries. Indeed, the limitations of the bundle of rights are fundamental to the challenges of large landscape conservation.

Conservation easement acquisitions also do not magnify the public interest in land and wildlife in general. One legal scholar suggested that the public interest is the cord that binds the bundle of sticks: 'instead of reinforcing the Lockean notion that the sticks, which represent private property, exist separate and apart from the community, we explicitly acknowledge that without the bonds of community there would be no bundle' (Duncan 2002). This conceptualization of intertwined public and private interests is quite different from the conservation easement concept in which the public or conservation sticks are purchased and held by a non-governmental organization or government, while the private landowner retains those sticks unencumbered by the easement.

This study has several limitations, in that it focused on conservation easements by one biodiversity-missioned non-profit land trust in California, which is a relatively wealthy and rapidly developing state with a system for regulatory land-use planning. The importance of property responsibilities, and the mix of owners and powers at play in conservation acquisitions, are likely to vary considerably across regions.

The property-by-property conservation easement approach continues the fragmentation of land and conservation policy among institutions and across scales that is the trend in natural resources policy throughout the 20th and 21st centuries (Raymond & Fairfax 1999). The shift from absolute dominion to the bundle of rights was an industrial-era innovation in the commodification of partial property. It also allowed for government regulation of private property and acquisition of partial property for conservation. Today, current usage of the bundle of rights metaphor limits the conceptualization and the practice of property acquisition in complex socioecological landscapes.

CONCLUSIONS

The dynamic relationship between property as a concept and an institution demands greater recognition of property concepts in the design of conservation strategies. Scholars have critiqued conservation easements, calling for greater social equity, ecological outcomes, financial justification and public accountability (Merenlender *et al.* 2004; King & Fairfax 2006). This research examines the assumptions underlying concepts of partial property acquisitions. While a divisible bundle of rights can be tailored for unique regions, fragmented rights may be insufficient for wildlife habitat conservation, as evidenced by landowner clearing of vegetation in the periurban Tenaja Corridor. In both regions, easement acquisition emphasized landowner rights and compensated restrictions over duties. The limits of acquisition in achieving cross-boundary wildlife connectivity are particularly striking in the Tenaja Corridor, where conservationists recognized the need for regional regulatory authorities for wildlife conservation. Alternative concepts of property as a bundle of duties, powers and owners, and a web of interests, illuminate the social and political context for environmental conservation.

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