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Source: *Frontiers in Ecology and the Environment*, Vol. 5, No. 3 (Apr., 2007), pp. 125-130

Published by: Ecological Society of America

Stable URL: <http://www.jstor.org/stable/20440607>

Accessed: 26/04/2010 18:06

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# Conservation easements in context: a quantitative analysis of their use by The Nature Conservancy

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Conservation easements have become the principal tool used by land trusts to preserve habitat and open space. However, anecdotal evidence has led some to question whether easements actually deliver conservation value. Our analysis of data from 119 easements held by The Nature Conservancy (TNC), spanning eight states and 20 years (1984–2004), is the first study to examine temporal patterns in the stated goals of, and activities allowed under, conservation easements. We found that these easements operate in accordance with conservation principles: 96% of sampled easements have identified biological targets, 84% are within TNC priority sites, and 79% are adjacent to protected areas. Easement usage has also become more strategic; recently established easements are more likely than older easements to be large and to include a management plan that focuses on biological targets. The one shortcoming we uncovered is a lack of biological monitoring. Although 92% of sampled easements have been monitored for legal compliance in the past 3 years, only 19.8% of biological targets have been monitored quantitatively. It is clear that we cannot draw conclusions regarding easement effectiveness unless we implement more systematic monitoring.

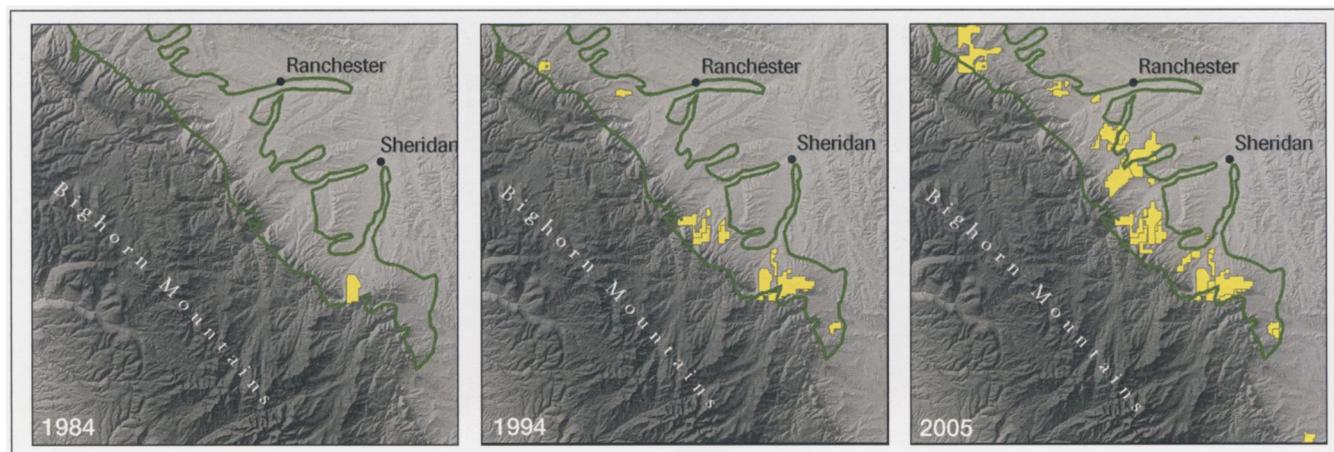
*Front Ecol Environ* 2007; 5(3): 125–130

Protecting biodiversity on privately-owned land is essential in the United States, where fewer than 10% of endangered species occur exclusively on public land (Scott *et al.* 2001). One approach to preservation might be to convert private land to nature reserves, but that solution removes people from the land, disenfranchises property owners, and eliminates productive activities and taxable incomes (Wright 1993). An increasingly popular alternative involves conservation easements, which are volunteer agreements entered into by property owners in return for direct payment or tax breaks (Gustanski and Squires 2000). Property ownership entails certain rights, including those to subdivision, water, minerals, and timber. Under a conservation easement, some of those rights are voluntarily sold or donated by the landowner, thus limiting certain uses or activities in perpetuity. The most common limitation attached to easements is restriction of future subdivision and development.

Conservation easements are currently the chief tool used by land trusts to preserve habitat and open space. In fact, in 2000, land trusts held approximately 60% of their land interests in the form of conservation easements (LTA 2004). In the 5 years between 1998 and 2003, the area of conservation easements held by land trusts nearly tripled to over 5 million acres (LTA 2004). However, easements have been criticized because anecdotal reports suggest that some easements do not serve any conservation function (Christensen 2004). Little information is available regarding the resources being protected and, consequently, it is difficult to assess the success of these initiatives (Merenlender *et al.* 2004). However, it has been suggested that easements are often established in an ad hoc fashion not conducive to conservation (Morris 2004). Additionally, there are concerns that easements may fall short of their goals because they allow commercial and recreational activities that adversely affect conservation (Merenlender *et al.* 2004). Despite these concerns, there are many well-documented examples of easements that have successfully achieved conservation goals (eg Figure 1), but, to date, even the academic literature on conservation easements is qualitative (but see Yuan-Farrell *et al.* [2005] and Rissman *et al.* [in press]). It is critical that we examine the criticisms of easements using data as opposed to anecdote.

To quantitatively characterize conservation easements, examine the process of easement selection, and describe easement goals, we investigated the US holdings of the largest private land conservation organization, The

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**Figure 1.** Progression of conservation action in the Bighorn foothills of WY, part of the Northern Great Plains Steppe Ecoregion, from 1985–2005 (TNC 1999). This site is an excellent example of how strategic planning can drive the achievement of landscape-level goals; the combined acreage protected, 31 071 acres (19.9% of the site), meets the goals established for biological targets (presence of shrub wooded draw communities and rare plants, including Woolly twinpod, *Physaria lanata*, *Purpus sullivantia*, and *Sullivantia hapemanii*) in the ecoregional plan (TNC 1999; Kiesecker and Copeland in prep).

Nature Conservancy (TNC). Our analysis focuses on a subset of conservation easements: those explicitly designed to preserve biodiversity. TNC has been involved in private biodiversity conservation for over 50 years and works in all 50 states. The organization holds more easements (1983) and more acres of easements (3.2 million) than any other land trust in the US (TNC unpublished). These holdings represent more than one third of the total conservation easement acreage held by US land trusts (LTA 2004). TNC is also the world's largest land trust and claims to be "science based". It therefore has the resources and institutional culture to deploy easements in a strategic manner. Here, we have used TNC data to consider the following questions: (1) how are easements selected; (2) what activities do easements allow that may impact their conservation value; and (3) what strategies does TNC use to maintain conservation value? This is the first study to examine temporal patterns in the stated goals of, and activities allowed under, conservation easements based on a large random sample.

Here, we characterize the variety of easements, develop an analytical understanding of how they are used, and investigate whether temporal trends in the attributes and implementation of easements mirror trends in the advancements of conservation science. When easements were first becoming a popular conservation strategy in the early 1970s, conservation planning did not exist as a discipline, there were few published papers on working landscapes, and conservation was essentially the science of nature reserves and endangered species protection. The field of landscape ecology had barely been founded; the first issue of the journal *Landscape Ecology* did not appear until 1987. We therefore stratified our study into two time periods, to examine the development of easements as a conservation strategy in conjunction with advances in conservation science.

## ■ Methods

We focused on a sample of randomly selected easements from eight states (CA, FL, MD, MI, NH, TX, WA, and WY). The states were selected from among the contiguous 48 states such that their easements would span the range of variation in "conservation context", being situated in locations varying widely in wealth, percent of public versus private land, species diversity, and the extent of TNC easement activity. The selected states also varied in per capita income, percent of state land protected, species risk, species richness, species density, area of TNC easements, and number of land trusts (Table 1). In particular, we sought states that used easements infrequently as a conservation tool and others that relied heavily on easements.

Because most easements have been established within the last 5–10 years, a strictly random sample from our eight states would not include many easements established prior to 1995. For this reason, we stratified our sampling within each state by time period, drawing 10–11 easements (or fewer, if fewer were available) acquired within each of two time periods: 1985–1994 and 1995–2004. The total number of easements per state ranged between nine (WA) and 137 (WY), with as few as zero (for 1985–1994 in MI) and as many as 98 (for 1995–2004 in WY) in any 10-year period. In total, our random sample included 119 easements, with a sampling intensity that ranged from 15% (20 out of 137 for WY) to 91% (10 out of 11 for MD). To characterize each of the sampled easements, we used a survey that drew on the expertise of conservation staff directly familiar with the easements, monitoring records, and original easement documents. Altogether, we collected data on 236 attributes for each easement. The survey and data are available online ([http://conserveonline.org/workspaces/TNC Easement Study](http://conserveonline.org/workspaces/TNC_Easement_Study)).

We structured our analysis around temporal trends in

**Table 1. Comparison of eight sampled states with respect to pertinent variables**

	CA	FL	MD	MI	NH	TX	WA	WY
TNC easement acreage	218 387 (5)	123 907 (10)	3528 (33)	156 631 (8)	27 792 (11)	206 636 (7)	5850 (30)	239 316 (4)
Regional/local LT easement acreage <sup>1</sup>	298 472 (6)	35 667 (19)	174 337 (7)	44 243 (16)	119 792 (10)	119 574 (9)	34 077 (21)	35 425 (20)
No. land trusts <sup>1</sup>	172 (1)	29 (21)	46 (9)	47 (8)	39 (12)	32 (17)	32 (18)	5 (43)
Population density (people/acre) <sup>2</sup>	0.35 (12)	0.45 (8)	0.7 (5)	0.19 (15)	0.22 (20)	0.13 (28)	0.14 (25)	0.01 (49)
2001 gross state product (millions \$US) <sup>3</sup>	1359 (1)	491 (4)	195 (16)	320 (9)	47 (38)	764 (3)	223 (14)	20 (49)
2003 per capita income (\$US) <sup>4</sup>	33 749 (13)	30 446 (18)	37 331 (4)	30 439 (15)	34 702 (7)	29 372 (32)	33 332 (12)	32 808 (36)
Percent land protected <sup>5</sup>	24 (2)	13.3 (5)	6.4 (16)	3.8 (23)	7.9 (13)	1.4 (37)	14.7 (4)	9.2 (12)
Percent species at risk <sup>6</sup>	29 (2)	14.3 (6)	3.9 (35)	4 (34)	2.8 (44)	10.1 (11)	7.3 (18)	6.8 (21)
Total species richness <sup>6</sup>	6717 (1)	4368 (7)	3148 (28)	3135 (29)	2327 (44)	6273 (2)	3375 (20)	3184 (26)
No. federally listed species <sup>7</sup>	304 (2)	111 (4)	26 (24)	21 (30)	11 (46)	91 (5)	40 (17)	17 (44)

Ranking out of 50 states indicated in parentheses. References describe data sources and are available in WebTable 1.

the easements because we assumed that, given TNC's recent commitment to science-based conservation planning (TNC 2000a), the characteristics of its easements may have changed over time. We also hypothesized that, given the emergence of landscape ecology (Meffe and Carroll 1997), one might expect easements to become larger and be selected to a greater extent for their landscape context over time. We used stepwise logistic regressions to compare older (1985–1994) and more recently established (1995–2004) easements with respect to strategic conservation actions that might impact conservation value of an easement and stewardship activities on the easement. In addition, we refined these comparisons to include only easements established prior to 1990 and after 2000, because these time periods more sharply reflect the differences in the development of conservation science and TNC practices. We also used logistic regression to examine patterns in the application of ecological monitoring on easements (eg with respect to easement size, whether the easement was core or buffer habitat for the target). We used simple linear regression to compare the change in continuous response variables (eg acreage) over time. All statistical analyses were performed using the statistical software SPSS Version 11.

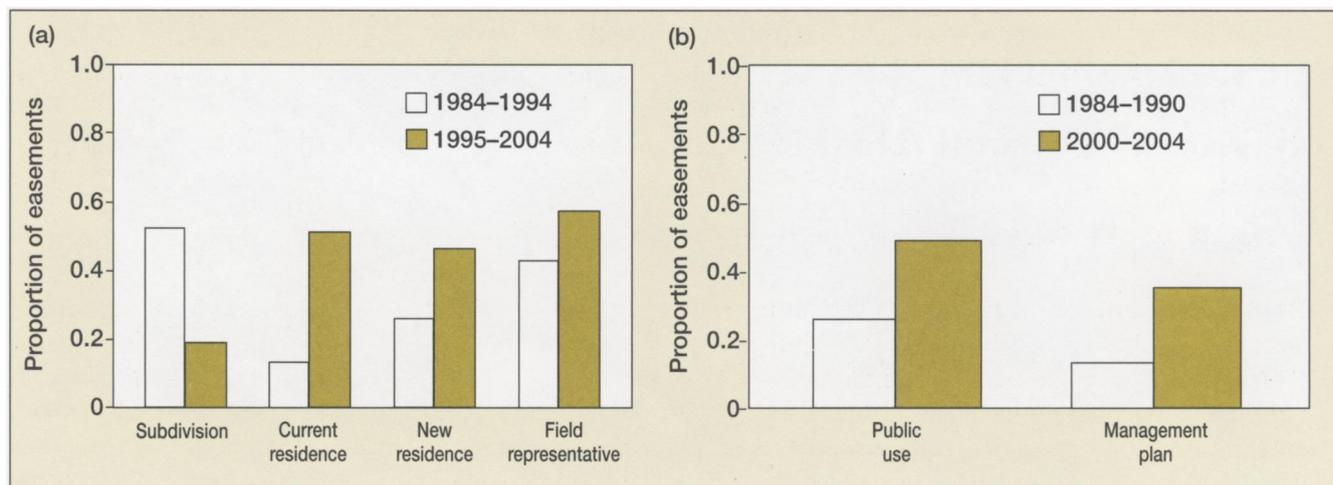
## Results

### Temporal trends

We found that recent easements are less likely to allow subdivision than older easements, though they are more likely to have an existing residence and are more likely to permit the construction of additional residences (Table 2a; Figure 2a). Recent easements are also more likely to have a field representative, or other individual with responsibility for executing strategies identified in ecoregional and conservation action planning at a given locale (Table 2a; Figure 2a). Recent easements also tended to be larger ( $\beta = 0.072$ ,  $t_{118} = 1.85$ ,  $P = 0.067$ ) and were slightly less likely to be donated ( $\chi^2(1) = 2.95$ ,  $P = 0.09$ ; Figure 3a). Furthermore, when we refined comparisons to include only easements established prior to 1990 and after 2000, we found that recent easements were more likely to allow public uses than older easements (Table 2b; Figure 2b). Recent easements were also more likely than older easements to have management plans that included components to protect identified biological targets (Table 2b; Figure 2b).

### Quantitative ecological monitoring

Although 92% of all easements have been monitored for legal compliance in the past 3 years, only 19.8% of the



**Figure 2.** (a) Effect of date of easement establishment (1984–1994 vs 1995–2004) on the likelihood that an easement allows subdivision, has a residence at the time of the survey, allows for development of new residences, and has a community-based field representative. (b) Effect of date of easement establishment (1984–1990 vs 2000–2004) on the likelihood that an easement allows public uses and has a management plan that protects identified biological targets.

385 biological targets are monitored quantitatively. The targets for recent easements were less likely to receive quantitative monitoring than those for older easements (1985–1994 = 27.3% targets monitored, 1995–2005 = 15.5%;  $\chi^2(1) = 7.59, P = 0.006$ ). Among several possible explanations for this pattern is that older easements are more likely to be threatened by fragmentation and degradation of surrounding habitat, which could be a stimulus for the launch of a monitoring program. We found some support for this idea by using logistic regression to test the hypothesis that older easements are more likely than recent easements to be under threat from development or fragmentation. Time was a continuous variable in this analysis. As expected, older easements were more likely to have experienced the threat of development or fragmentation ( $OR_{105} = 5.76, P = 0.0164$ , excluding 13 easements with responses of “not applicable” or “status unknown”).

There is some indication that the ecological monitoring being conducted is directed toward priority easements, as larger easements are more likely to receive ecological monitoring ( $\chi^2(1) = 7.25, P = 0.007$ ). Monitoring is also concentrated in easements that serve as core or corridor habitat, with 23% of targets for those easements receiving quantitative monitoring compared to 0% of targets for easements that serve as buffer habitat ( $\chi^2(1) = 20.23, P < 0.001$ ). Monitoring also appears to be concentrated in easements where surrounding land use might have greater potential for impacting conservation value ( $\chi^2(1) = 11.09, P = 0.026$ ; Figure 3b). Targets were more likely to be monitored if they were on easements where the predominant surrounding land use involved either some commercial or residential activity (Figure 3b).

**Important easement attributes that did not change through time**

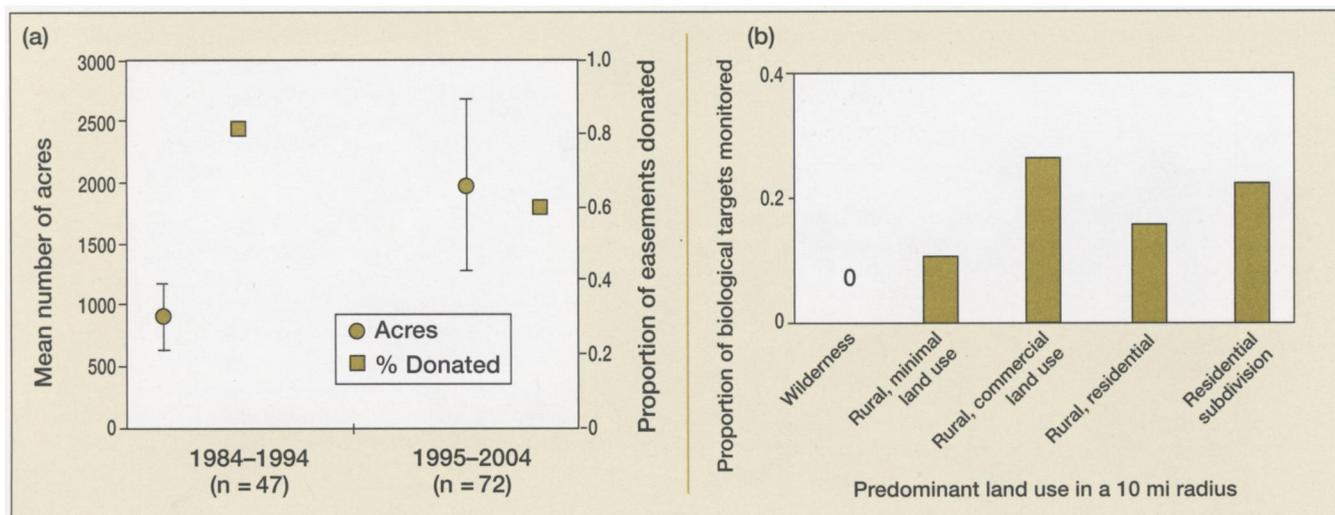
No variables other than those discussed above exhibited significant temporal trends, revealing some important consistencies in the sampled easements. For example, overall, 96% of the sampled easements have identified biological targets, 84% are within TNC priority sites (areas selected as a result of ecoregional planning), 79% are adjacent to other protected areas, and 62% are within areas that have a Conservation Action Plan, an addi-

**Table 2. Results of stepwise logistic regressions**

Variables	Chi-square ( $\chi^2$ )	df	P	% correctly predicted
<b>(a)</b>				
Allows subdivision	10.03	1	0.002	
Current residence	4.83	1	0.028	
Allows new residence(s)	5.33	1	0.021	
Field representative	6.41	1	0.011	
Time				
	1984–1995			63.9
	1995–2004			86.0
<b>(b)</b>				
Allows public use	5.48	1	0.019	
Management plan	4.37	1	0.037	
Time				
	1984–1990			77.8
	2000–2004			93.8

(a) Stepwise logistic regression of date of easement establishment (1984–1995 vs 1995–2004) on multiple predictors (see note). (b) Stepwise logistic regression of date of easement establishment (1984–1990 vs 2000–2004) on multiple predictors (see note). For simplicity we have only included additional significant predictors; all predictors listed in (a) were also significant in model (b).

Notes: Predictors included in our full models: Adjacent to a protected area, Allows commercial use, Allows new residences, Allows public use, Allows subdivision, Baseline Documentation Report, Biological targets, Conservation Action Plan, Current residence(s), Ecological monitoring, Field representative, Management plan, Priority site, Stewardship liaison. See WebTable 2 for descriptions of predictors.



**Figure 3.** (a) Mean acreage ( $\pm 1$  SE) of easements and relative frequency of donated easements in 1984–1994 and in 1995–2004. (b) Proportion of biological targets that receive quantitative ecological monitoring as a function of the predominant land use within a 10 mile radius of the easement.

tional form of strategic planning. Furthermore, 89% of the sampled easements have a Baseline Documentation Report (a document that serves to gauge both biological and legal compliance for the property), 65% have a stewardship liaison (an individual responsible for addressing issues beyond those of normal legal compliance monitoring), and 52% allow some form of commercial activity.

## ■ Discussion

Many people believe that biodiversity conservation cannot be accomplished with nature reserves alone and that we must develop approaches that protect biodiversity in the midst of working landscapes. Conservation easements represent such a strategy; they restrict land uses in specific ways that are intended to protect biodiversity, yet still allow private ownership and economic activity. Easements have grown in popularity in the US, Latin America, and Europe (where they are called conservation covenants).

We found that most easements are located in areas identified as high conservation priorities (ie areas selected as a result of ecoregional planning), and that most are, in fact, adjacent to other protected areas. Almost all easements have explicitly identified biological targets, an indication that they were established with clear conservation purposes. Moreover, there is a trend over time toward larger easements that are purchased rather than donated. Donated easements may be less likely to be strategically located than easements that a land trust uses funds to purchase. Overall, our random sample suggests strategic deployment of easements with clear biological objectives.

The next question is whether these easements are in fact protecting their biological targets. Importantly, TNC does not, in most cases, have the data to answer this question. Indeed, fewer than one in five conservation targets are quantitatively monitored on easements. The Nature Conservancy has no explicit guidelines on where, when,

or how to monitor easements for their conservation effectiveness. In this regard, TNC is similar to most land managers. Although land managers of protected areas spend millions of dollars annually to conserve biodiversity (Castro and Locker 2000), monitoring to evaluate the effectiveness of these conservation strategies remains largely neglected (Salafsky *et al.* 2002).

It is too expensive and impractical to monitor all easements. Ideally, standard guidelines would direct the selection of easements for monitoring. The small fraction of targets in our sample that do receive ecological monitoring are associated with those easements where monitoring is likely to be a worthwhile investment (ie easements with high value or under serious threat). Specifically, ecological monitoring was more likely on larger easements, on easements with surrounding land uses (commercial and residential activities) that are likely to impact biological targets, on easements in areas with increasing threat of subdivision or development, and on easements that were defined as providing core habitat or corridors (as opposed to simply being a buffer for nearby protected lands). Thus, even though quantitative biological monitoring is rare, at least it is directed at easements of high conservation value or risk.

In the future, land trusts must think strategically about monitoring and must develop practical guidelines for when and how to monitor. Conservation generally has a record of failing to evaluate the effectiveness of its initiatives (Ferraro and Pattanayak 2006). When it comes to easements, this failure is especially crucial, as public funds and tax breaks are often involved. Land trusts should work to ensure that the public trust is well served.

## ■ Acknowledgements

We thank TNC staff who provided assistance during data collection and comments on this manuscript. Financial support was provided by a National Science

Foundation Biocomplexity grant on agricultural land transformations (to PK).

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