

Research

Conservation and Unscripted Development: Proximity to Park Associated with Development and Financial Diversity

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ABSTRACT. Decades of research on the social dynamics of biodiversity conservation has shown that parks and protected areas have added hardship to rural communities throughout much of the developing world. Nonetheless, some recent studies have found evidence of poverty alleviation near protected areas. To build on these conflicting accounts, I use a comparative, mixed-methods design to examine opportunistic, unplanned, i.e., unscripted, development in indigenous communities near Tarangire National Park (TNP) in northern Tanzania. I ask the questions: (1) How is proximity to TNP related to community-level infrastructural development? (2) How has the process of development changed over time? and (3) How is proximity to TNP related to infrastructure-related social outcomes at the household-level? Results from semistructured interviews show that, compared with distant communities, communities near TNP have developed more extensive education and water infrastructure in the past decade by procuring financial support from a greater diversity of external organizations, including wildlife-related organizations. Correspondingly, household survey results show that education measures are positively associated with proximity to TNP, controlling for other factors. These findings support the notion that development can accrue near protected areas in ways that are diverse, uncoordinated, and opportunistic, and correspondingly distinct from heralded community-based conservation, community-based natural resource management, and integrated conservation and development project initiatives.

Key Words: *Africa; conservation; development; education; infrastructure; Tanzania*

INTRODUCTION

One of the dominant conclusions that may be drawn from the decades of research on the social dynamics of biodiversity conservation is that parks and protected areas (PAs) have added hardship to households in rural communities throughout much of the developing world (Brosius et al. 2005, West and Brockington 2006, Brockington et al. 2008). This situation has raised several social and ecological concerns. Social scientists, NGOs, activists, indigenous groups, and others have pressed for issues involving social justice, rural poverty, and development to become central to discussions of biodiversity protection (Dowie 2009). Conservationists, for their part, have begun to recognize the importance of building coalitions with local groups to manage and protect natural resources (Adams et al. 2004, Child 2004, Tallis et al. 2008, Abrams et al. 2009). Many, however, have challenged the prospect that pervasive and unassailable poverty in the developing world must become the purview of the conservation movement, constrained as it is by economic and political burdens (Brandon et al. 1998, Naughton-Treves et al. 2005, Leatherman 2008).

Research on these issues, specifically the social concerns associated with biodiversity conservation, has generally fallen into one of two camps: (1) small qualitative case studies, lacking controls, which describe the social costs associated with parks; and (2) large, quantitative analyses of secondary data using comparative designs. Curiously, these two bodies of scholarship have typically yielded different conclusions. Smaller, qualitative studies have illustrated in great detail the causal mechanisms by which park-side communities have struggled, which have included eviction (Brockington and Igoe 2006), alienation of resources (Neumann 1998), and impoverishment (Cernea and Schmidt-Soltan 2006). Recently, larger quantitative studies that include controls have observed some poverty alleviation near PAs (Andam et al. 2010, Sims 2010, Barrett et al. 2011, Ferraro and Hanauer 2011, Naughton-Treves et al. 2011) though the cause of

change is generally not clear. This discrepancy points to the need for new research that uses mixed methodologies to examine both the cause of changing social welfare indicators and the incidence of change within a comparative framework that includes controls (Wilkie et al. 2006, Redford 2011).

In this paper I examine the effect of proximity to Tarangire National Park (TNP) in northern Tanzania on development trends within agro-pastoral communities in Simanjiro District since the park's establishment in 1970. Here, parks are viewed as agents of change and consequently conservation/community landscapes are viewed as dynamic areas where local groups respond to constraints and seize on new opportunities. Following this perspective, this paper examines the processes and patterns of infrastructural development in communities near TNP compared with control communities.

BACKGROUND

Community-based conservation, community-based natural resource management, integrated conservation and development projects, and unscripted development

In response to the rapid expansion of biodiversity protection around the globe and the growing catalog of conflicts and social concerns associated with parks and PAs, many groups, including local and international organizations, have embraced strategies to promote joint conservation and rural development initiatives (Agrawal and Redford 2006). These efforts have taken several forms including community-based conservation (CBC; Hackel 1999, Berkes 2004), community-based natural resource management (CBNRM; Jones and Murphree 2004, Brosius et al. 2005, Child and Barnes 2010), and integrated conservation and development projects (ICDP; Brandon and Wells 1992, Barrett and Arcese 1995, Newmark and Hough 2000, Wells and McShane 2004).

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In Africa, outcomes associated with these new approaches have been mixed. In some cases, studies have found that CBC, CBRNM, and/or ICDP programs have increased access to land and employment (Mbaiwa et al. 2011, Yasuda 2011), improved infrastructure and economic diversification (Sheppard et al. 2010), promoted higher incomes, and reduced environmental impacts from local livelihoods (Abbot et al. 2001). In the majority of cases, however, research has found these initiatives lacking and correspondingly many refinements have been proposed. These have included calls for program designs to incorporate greater focus on cultural context (Waylen et al. 2010), education (Peters 1998, Wainwright and Wehrmeyer 1998), adaptive capacity (Armitage 2005), governance (Brechtin et al. 2002), social institutions (Agrawal and Gibson 1999, Nelson and Agrawal 2008), social, physical, and economic capital (Garnett et al. 2007), equitable distribution of benefits (Bandyopadhyay and Tembo 2010, Yasuda 2011), gender issues (Wainwright and Wehrmeyer 1998), financial interfaces (Blaikie 2006), stronger connections between conservation and development goals (Martin et al. 2011), and improved ecological monitoring (Kremen et al. 1994).

In East Africa specifically, patterns have been similar. Although some scholarship has pointed to successful, small-scale collaborations between conservationists and local groups (Morgan-Brown et al. 2010, Nelson et al. 2010, Sachedina and Nelson 2010), the majority of research on conservation landscapes in this region has identified struggles between conservation and development. Specifically, these studies have highlighted economic decline (McCabe 1992), negative local perceptions of conservation (Baird et al. 2009, Davis 2011), the marginalization of local groups and local knowledge in CBC design (Goldman 2003, 2011), the challenges internal to indigenous rights NGOs (Igoe 2003), interethnic group conflict (Greiner 2012), power struggles between local groups and conservation planners (Brockington 2004, Baker et al. 2012), corruption and local governance (Brockington 2007), and the growth of conservation NGOs (Sachedina 2010).

Although much has been written about the promise of, and/or challenges with, hybrid conservation/development initiatives, which remain uncommon in many areas, few studies have focused on unplanned, ad hoc, opportunistic approaches to development that may be deployed by local communities to adapt to constraints and capitalize on perceived access to local, state, and foreign organizations operating around parks. Even without active CBC, CBRNM, or ICDP programs, parks and PAs can be strong attractors of tourist infrastructure and NGOs concerned with conservation, religious, or indigenous rights issues (Levine 2002, Campbell and Vainio-Mattila 2003). Such organizations may seek to work with local communities (Coomes et al. 2004, Tallis et al. 2008), or may be recruited by park-side communities to provide support for development projects. Organizations can engage directly with community-level committees, organizations, and/or other institutions to: build or repair infrastructure, implement health interventions, facilitate community education programs, influence local land use, and/or other types of community outreach. Interactions between local institutions and outside organizations may serve as added constraints within communities (Haley and Clayton 2003, Igoe 2003) or function as new constructive opportunities. Either way, outside organizations can become part of the overall metabolism of conservation

landscapes and strongly shape the local context in which social, economic, and environmental outcomes are determined. Opportunistic interactions between organizations and park-side communities, and the “unscripted,” or ad hoc, development activities that can result therefrom, must be examined to gain a more full appreciation of the effect of biodiversity conservation on local areas. Here “unscripted development” is defined as the accumulation of opportunistic and uncoordinated development projects, which can emerge outside the confines of a grand plan or script, as is common to CBC, CBRNM, and ICDP initiatives.

To examine unscripted development, I compared six communities to the east of TNP, where CBC, CBRNM, and ICDP initiatives have been extremely limited since the park was created. Specifically, I examined three research questions (RQs): (RQ1) Is proximity to TNP associated with community-level infrastructural development projects? If so, how? (RQ2) Has the process of development changed over time? If so, how? and (RQ3) Is proximity to TNP associated with measures of education at the household level? If so how? In the case of RQ3, education was viewed as a proxy for household-level behavior that is directly related to community-level infrastructure.

Study site

The study site lies within the Tarangire-Manyara region of northern Tanzania. The region is semiarid, characterized by high rainfall variability and frequent droughts, and is among the most diverse and complex grassland savanna ecosystems in the world (Olson and Dinerstein 1998). TNP, which lies at the heart of a large network of PAs in northern Tanzania, protects important dry season water resources that help to support the largest population of elephants (*Loxodonta africana*) in northern Tanzania and the second largest seasonal migration of large ungulates in East Africa. To the east of the park, spread across several local communities, the Simanjiro plains offer important grazing and calving areas for thousands of wildebeest (*Connochaetes taurinus*) and zebra (*Equus burchelli*) that migrate to the area to feed on nutrient-rich forage in the wet season.

Also in this area, local Maasai communities have traditionally practiced transhumant pastoralism to cope with seasonal fluctuations in water and forage availability. The area that is now the park was once an important refuge for livestock during the dry season, however, when the park was formed in 1970, access to these resources was cut off. In response to these and other factors, the Maasai have been incorporating agriculture and wage-labor migration into their livelihood strategies in the last several decades (Cooke 2007, McCabe et al. 2010, Baird and Leslie 2013). This conversion has been associated with a more sedentary lifestyle and a shift away from communally managed lands to more individual land tenure.

Local efforts to adapt to park-related constraints, however, have not alleviated the persistent tension and conflict that has characterized the relationship between TNP and local communities. A large number of studies in this area have described local park/community interactions (Igoe 2002, Goldman 2003, Cooke 2007, Sachedina 2008, Baird et al. 2009, Davis 2011). These studies have consistently found park/community interactions to be strained, unproductive, and negative. Furthermore, within the communities near the park, a pervasive local narrative exists that maintains that the park was an unjust seizure of Maasai lands

and that the park has been, and remains, an obstacle in their lives that proffers no benefits to local people. This strongly held narrative has undoubtedly coalesced around local experiences and perceptions, which involve not only interactions with the park itself but interactions with the constant stream of researchers who have asked many questions about the park over the last many years.

METHODS

Data collection

The study was conducted within the predominantly ethnically Maasai district of Simanjiro between January and December 2010. Six study communities were selected based on geographic proximity to the eastern border of TNP. Two communities are adjacent to the border; two are located near the park, but not adjacent; and two are located farther from the park (see Fig. 1 and Table 1). Throughout the paper, the four communities adjacent to and near the park will be collectively referred to as “near” unless otherwise explicitly stated. Study communities were selected to highlight the effect of proximity to TNP on community and household outcomes while minimizing the effect of ethnic, socioeconomic, geographic, and environmental factors.

Fig. 1. Map of study area.

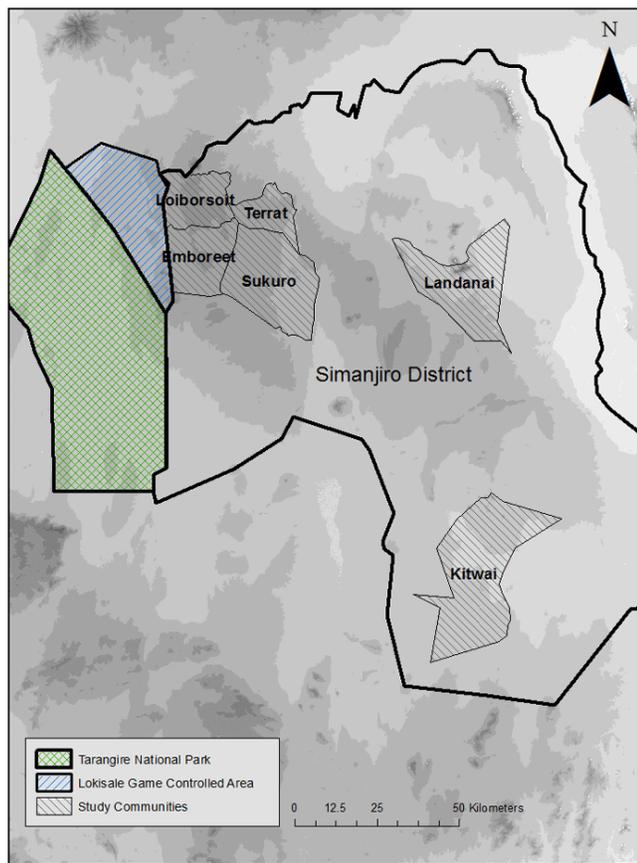


Table 1. Study communities population and proximity to Tarangire National Park (actual and categorical).

Community	Population in 2002 (TZ Census [†])	Approx. Distance to Park [‡] (km)	Near (Adjacent/Not Adjacent) and Far
Loiborsoit	4160	27	Near (Adjacent)
Emboreet	2244	23	Near (Adjacent)
Terrat	2837	43	Near (Not Adjacent)
Sukuro	2704	34	Near (Not Adjacent)
Landanai	4993	92	Far
Kitwai	1273	96	Far

[†] The 2002 Tanzanian Census (Tanzanian National Bureau of Statistics, 2004) offers the most reliable estimate of population for these communities.

[‡] Represents Euclidean distance from the community center to the eastern border of Tarangire National Park.

Fieldwork involved mixed qualitative and quantitative methods of data collection, which included semistructured stakeholder and group interviews (n = 64), participant observation, and a structured survey of households (n = 216). In the absence of current, reliable census records and the resources to construct exhaustive sampling frames in each community, which each contain several hundred households widely distributed across the landscape, a quota sample (Bernard 2006) was drawn wherein individuals from each age-group, wealth status, and geographic location within each community were included. Local leaders were enlisted to assist in the identification of households to meet these sampling criteria. This reflects my best efforts to draw a representative sample. Maasai field assistants and I conducted interviews in Maa, the local language, and/or Kiswahili, the national language of Tanzania.

Stakeholder and group interviews

To identify all infrastructural features that had been built in the communities, what form they had taken, and how they had been financed (RQ1), I conducted qualitative, semistructured stakeholder and group interviews with community leaders, government officials, including current and former officials, school administrators, and community members in each study community. Respondents and group interview participants were selected specifically for their knowledge of local development issues. This approach was used to facilitate open discussion and solicit descriptive narratives around broad questions from people who would have been involved with or known about local projects. Questions focused on the number, location, and financial history of water points, schools, both primary and secondary, health clinics, churches, veterinary and agricultural services, roads, transportation, cell-phone coverage, and other material development projects. “Financial history” refers to the source of money that was used to support the infrastructural feature from its construction through 2010, e.g., sources of funds to build a school or repair a broken bore-hole pump. Interviews also solicited information on how the process of development has changed over time (RQ2) including how projects/funds came to the community, e.g., did the community actively recruit the project or funds to the area or was the project introduced to the

community from some outside entity? It is important to note that although the total number of infrastructural features, i.e., schools, water points, etc., in the study area is small, the data presented here represent a complete census of these components throughout the study communities ($n = 63$) as well as the sources of funding that have supported their construction and/or maintenance.

Household survey

I designed and field-tested a structured household survey to assess whether community-level development projects were associated with household-level behavior (RQ3). Trained Maasai enumerators conducted the survey with 36 household heads in each of the six study communities ($n = 216$). Household measures of education were identified as suitable indicators for household response to community-level projects. The survey solicited information on several education-related topics including: the level of education for the household head and the percentage eligible children enrolled in school; eligible is defined as between the ages of 6 and 15 (Serneels et al. 2009). This approach was utilized because it was effective at estimating the incidence of household measures of educational attainment and enrollment across the study communities.

Data analysis

This research proceeded in three main analyses each comprised of multiple steps. The goal of the first set of analyses was to construct time lines of community-level infrastructural development for each community to show: (1) each development project; (2) and the sources of financial support for each project (RQ1). The goal of the second set of analyses was to describe, qualitatively, local perceptions of the process of infrastructural development and how it has changed over time (RQ2). The goal of the third set of analyses was to estimate the effect of proximity to TNP on household heads' education and school enrollment for school-age boys and girls in 2010 controlling for other factors (RQ3).

To construct time lines for each study community to represent each infrastructural development feature and its sources of financial support (RQ1), content analysis of qualitative group interviews was used to extract information on the years features were completed as well as the years that projects ceased to be useful, i.e., dam failed and was not repaired. Although interviews on the history of development projects identified many project types, including churches, grinding mills, cattle dips, etc., three specific types of infrastructure emerged as most important to community members and were illustrative of the differences and similarities that existed among the study communities: schools, water points, and health clinics. Therefore, for each community, each school, water point, and health clinic is represented on the timeline with a discrete icon, which indicates the type of infrastructural feature. To the right of the each icon, two letter abbreviations are included for each organization type that provided funding to build, repair, and/or maintain the feature. Only external organization types are included here. Community and/or local government contributions are not included. Therefore, icons with no abbreviations represent features supported only by local government and/or community funds.

To describe local perceptions of the process of infrastructural development and how it has changed over time (RQ2), content analysis of qualitative group interviews was again used to extract

and integrate information on development projects through time beginning with the earliest projects. These efforts focused on the evolution of project types and funding types in the development process, the distinction between solicited and unsolicited projects, the mechanics of funding, changing local values regarding development, and struggles. These insights are all from the perspective of local communities, including administrators, leaders, and community members, but not funding organizations.

To examine the association between proximity to TNP and infrastructure-related human behavior at the household level, i.e., education, controlling for other factors (RQ3), three regression models were estimated. First, I used a logistic regression model to estimate the effect of proximity to TNP on the odds that the household head had some formal schooling. A logistic model was used here because the dependent variable is dichotomous. Although my data include a continuous measure of education for the household head, this measure varies little as the vast majority of household heads who attended school indicated that they did so for seven years, i.e., primary school. Consequently, a dichotomous measure of education makes more sense than a continuous measure in this context. For the second and third analyses, I used Tobit models to estimate the effect of proximity to TNP on the percentage of school-age children, boys and girls separately, who were enrolled in school in 2010. Tobit models were used because the dependent variables are percentages and are therefore each censored at 0 and 1.

For each model, I used a dichotomous measure of proximity to TNP. Households from the 4 communities adjacent to and near TNP, i.e., Loiborsoit, Emboreet, Terrat, and Sukuro, were coded 1 and distant communities, i.e., Landanai and Kitwai, were coded 0. Categorization of the study communities in this way is supported by other studies from this area (Baird et al. 2009, Baird and Leslie 2013), which have found that the effect of the park is limited to the first four communities. Predictor variables included characteristics of the household head and household characteristics (see Table 2). Means for all variables used in the regression analyses are also presented in Table 2. All models were adjusted for clustering at the level of the community (Angeles et al. 2005), which corrects for any community-level correlation arising from the clustered sampling strategy.

Strengths and weaknesses of this approach

The comparative design of this study controls for the fact that development is lacking throughout this region and is not necessarily restricted to areas near the park. Many studies that look at the effect of parks and PAs on development outcomes focus only on areas near the park and therefore cannot separate the effect of the park from other factors (Wilkie et al. 2006, Andam et al. 2010, Barrett et al. 2011). Also, by focusing on development events in local communities and not park-related effects, I sought to avoid politically charged narratives of park-related hardships. Stakeholder and group interviews focused on the life-histories for all of the physical infrastructure in the communities; open ended questions about the park were not included. Another strength of this study is that the integration of qualitative and quantitative methodologies examines both the historical pattern and process of development at the community scale and the incidence of development-related outcomes, i.e., education, at the scale of the household. Studies on the effects of

Table 2. Descriptions of variables used in regression analyses.

Variable	Description	Full sample	Far from park	Near the park	Far vs. near [†]
Dependent variables					
Education (0/1)	Measure of whether or not the HHH had any formal education, i.e., attended school.	0.38	0.35	0.39	
% HH boys enrolled	Percentage of eligible boys in HH who are enrolled in school.	0.61	0.51	0.66	*
% HH girls enrolled	Percentage of eligible girls in HH who are enrolled in school.	0.51	0.41	0.57	
Individual controls					
Age 20-34 (0/1)	Age of HHH; Korianga age-set (the youngest group of household heads).	0.18	0.20	0.17	
Education (0/1)	Measure of whether or not the HHH had any formal education, i.e., attended school.	0.38	0.35	0.39	
Church (0/1)	HHH membership in any church.	0.72	0.80	0.68	
Household controls					
TLU	Tropical Livestock Units (measure of livestock holdings that accounts for differences across species) [‡] .	51.49	45.97	53.99	
AE	Adult Equivalent Units (measure of HH size that combines members of different ages and genders to compare provisioning requirements across households) [§] .	8.96	9.23	8.85	
TLU/AE	TLU divided by AE (measure of per capital livestock holdings). This is a common measure of wealth for Maasai.	5.37	4.88	5.60	
Proximity to park					
Near Park (0/1)	Measure of whether or not the HH is located in one of the 4 communities near the park.	n/a	n/a	n/a	n/a
N _{households}		209	65	144	
N _{communities}		6	4	2	

* $p < 0.05$

[†] Difference in means between far from the park and near the park tested using student's t-tests (continuous) or chi-squared tests (categorical).

[‡] Tropical Livestock Units (TLUs) are defined here as: 1 adult zebu cow = 0.71; adult sheep/goat = 0.17 (Homewood et al., 2009).

[§] Adult Equivalents (AE) is a measure of people expressed in terms of standard adult reference units, with respect to food or metabolic requirements. An adult male serves as the reference adult with other categories measured as fractions of that reference: adult male = 1 AE; adult female = 0.9 AE; male/female 10-14 years = 0.9 AE; male/female 5-9 years = 0.6 AE; infant/child 2-4 years = 0.52 AE (Homewood and Rodgers 1991, Sellen 2003).

HH = household, HHH = household head.

conservation rarely measure the incidence of household-behaviors and describe the evolution of causal factors. This study does.

There are three central weaknesses of this approach. First, the household sample size is small and the sampling strategy was not random. However, mean-measures of household wealth, from the household survey, are consistent with measures from much larger studies of Maasai households that utilize random samples (Homewood et al. 2009) suggesting that this sample is not necessarily skewed. Second, data collection was cross-sectional and reliable measures of community-level population change in the study area are unavailable (available data for the 2012 census are limited to administrative units above the community level). However, according to data from the 2002 census (see Table 1) large and small communities are represented in this study for both "near" and "distant" communities. Third, information regarding development arising from group interviews with community administrators was not corroborated with personnel from all relevant donor organizations. Some development projects took place decades ago and supporting organizations had moved and knowledgeable representatives were unavailable. Although further interviews with all available organizations would have

been instructive, I estimated that community records and recollections of local development would, on average, understate the role of outside organizations, whereas the organizations themselves may have incentives to overstate it. Given these inconsistencies and considerations, I chose to rely on local knowledge for all projects, a strategy that I determined would yield the most consistent and conservative data.

RESULTS

Location, timing, and financing of infrastructural development (RQ1)

The results of the time line analysis (Fig. 2) show that, prior to the formation of TNP, few schools, water points, or health clinics existed in the study area. Furthermore, distant communities do not appear to have been less well developed than communities near the park. Between 1970 and 2002, when Tanzania conducted a national census, development proceeded slowly throughout the study area. One notable difference during this period between the four communities near the park and the two distant communities is that development near the park was supported by several types of external organizations including religious organizations, tourist companies, hunting companies, and the national parks

association, i.e., TANAPA, whereas development in the two distant communities was only supported by the local government, e.g., colonial or district, and community contributions. Since 2002, development of schools and water points in the four communities near TNP notably outpaced development of these features in the two distant communities. As of 2010 primary schools and secondary schools were present or under construction in each of communities near TNP, whereas only primary schools were present in the distant communities. Far from the park, development was supported by some external organizations: two religious organizations in Landanai and a single hunting company in Kitwai. Contrasting with this, development near the park during this period was supported by many organization types including religious organizations, foreign donors, multinational NGOs, tourist companies, hunting companies, and TANAPA. Recent differences in terms of development between near and distant communities are not aligned with differences in communities populations (from 2002; see Table 1).

Local perceptions of the process of infrastructural development (RQ2)

Content analysis of group interviews on the evolution of development in the study communities revealed several themes. Here I describe two of the most important ones in terms of their relevance for this study: (1) the distinction between solicited and unsolicited development; and (2) the challenges and opportunities associated with wildlife-related organizations.

Since the time of the earliest development projects in the study area there has been a general shift from unsolicited to solicited projects. By “unsolicited” I mean that projects were not initiated or requested by the communities themselves. Conversely, “solicited” projects are those that local communities initiated themselves by soliciting external organizations. This shift is most strongly exhibited in the communities adjacent to the park, but can also be seen in the two other communities near the park, i.e., Terrat and Sukuro. Communities far from the park, however, have not received unsolicited support for development projects. In these communities support for all infrastructural development projects has been solicited.

Leading up to and following Tanzanian independence, governmental and religious organizations delivered many unsolicited resources to local people, especially improved water points like dug wells and dams to catch surface runoff, based on perceived needs and donor priorities. According to respondents near the park, the earliest development projects were unsolicited and generally funded by Christian religious organizations. Typically, organizations would simply come into a community, introduce themselves to leaders and ask for permission to work in the area. An elder recalled that, “they brought a letter asking if the community would welcome them to come and do development.” Often, development offers were made by religious organizations connected with local churches that had been established years before during the colonial period. These observations are consistent with other scholarship from this area (Hodgson 2005). One resident described this graduated engagement simply: “[they] came here, saw problems, and helped.” Another respondent said, that the “missionaries saw how people were suffering - even before the villagers were asking for

help, the missionaries stepped in to help.” In the early postcolonial period, much of the development in this area came in the form of churches and schools with the earliest projects located in the communities adjacent to the park with support from Catholic and Pentecostal missions. In some cases, development has continued since this period with only limited community oversight and control. One resident near the park noted that “the church has done many things. We are just seeing from afar. We don’t have a voice in these things.”

Over time, communities learned that they could shape ongoing streams of support that began with unsolicited contributions and solicit new resources from these organizations. According to one respondent near the park, the religious mission “asked for permission to preach [and] got land from the village. At that time the village asked for help with a school and the mission responded.” These communities also began to solicit support from new organizations, i.e., hunting companies, foreign donors, and TANAPA. In the two communities near, but not adjacent to, the park, i.e., Terrat and Sukuro, both unsolicited and solicited contributions have been important sources of support for development projects, however solicitations have been much more common here than in adjacent communities. These two communities began to solicit support from organizations that had previously provided unsolicited support in the communities adjacent to the park but pursued many other organizations as well. In the case of a foreign supported NGO, one respondent said, “They came here to sell their policies, pitch their services - and then they left. But then we followed them to ask for help.” Across the 4 communities near TNP, solicitations have taken many forms, which have included: drafting proposals to religious organizations; appealing to and hosting foreign donors; recruiting NGOs; leasing land use rights to photographic safari companies; and lobbying hunting companies and TANAPA for contributions.

In contrast with the situation near the park, most of the development in the communities far from the park has been financed through community contributions and district government funds with few opportunities to solicit external organizations for support, and correspondingly few successful solicitations. Exceptions to this have been modest contributions to water and school projects by the Lutheran church in Landanai and a single hunting company operating in Kitwai.

Wildlife-related organizations, including hunting companies, tourist companies, i.e., photographic safari companies, and TANAPA itself, have become notable sources of external support for infrastructural development in the four communities near the park. TANAPA has made large contributions in each of these communities building dams, school dormitories, and one entire health clinic. Photographic safari companies have paid these communities large sums for land allocations along the park border. Hunting companies, which have federal contracts, are required by law to support the development of the communities in which they operate (see Nelson et al. 2007, Sachedina and Nelson 2010). As of 2010, there were three hunting companies operating in the communities near the park, compared with only one in the distant communities. Within the last few years a consortium of conservation, tourism, and development

Table 3. Variable coefficients and significance tests from logistic and Tobit models of household education measures.

Predictors	Model 1 (Logit)	Model 2 (Tobit) [†]	Model 3 (Tobit) [†]
	Education	% HH boys enrolled	% HH girls enrolled
Individual controls			
Age 20-34 (0/1)	2.02*	-0.17**	-0.17***
Education (0/1)		0.01	0.02
Church (0/1)	5.51***	0.04*	0.09***
Household controls			
TLU	1.00	0.00	0.00
AE	0.89**	0.00	0.00
TLU/AE	1.01	0.01	0.00
Proximity to Park			
Near park (0/1)	1.38	0.05*	0.05*
N _{households}	208	171	159

[†] Tobit coefficients are presented as marginal effects on the dependent variable conditional on the dependent variable being uncensored.

* p < 0.05, ** p < 0.01, *** p < 0.001.

HH = household, TLU = tropical livestock units, AE = adult equivalent units.

organizations have paid communities near the park for ecosystem services, observations which have been described elsewhere (see Nelson et al. 2010).

Opportunities associated with wildlife organizations, however, have typically also involved many challenges and local perceptions of the quality of these projects are generally negative. Despite contributions from TANAPA and other organizations, communities cite the great number of ignored requests, and the long delay and poor construction of funded projects as evidence of a strained or failing engagement between the organizations and the communities. This is especially the case with TANAPA and hunting companies. Describing one community's experiences with TANAPA, a respondent noted that "you ask them today and they will respond in 5-6 years [and] they use their own contractors... poor construction." Local residents often complain of the quality of TANAPA development projects pointing out that dams have failed and that they are moving out of collapsing buildings. Interactions with hunting companies are equally challenging with many requests simply ignored; "we asked once to help build a school – but didn't get anything". In another case, a community adjacent the park informed a hunting company, "we don't want to see you on our land until you build an office." Alongside these perceptions is the widely held view that these organizations are profiting enormously from the proceeds of tourism and that the communities themselves are receiving comparatively little.

Effect of proximity to TNP on household education measures (RQ3)

The results of the regression analyses for the control variables (see Table 3) show that age and church membership were significantly related to educational outcomes for each model. In the model of the educational status of the household head (model 1), membership in the youngest age-group, i.e., age approximately 20-34, and membership in a religious organization, i.e., church, strongly increased the odds of having had formal schooling compared with older age groups and nonchurch goers, respectively. Also, a unit increase in household size, measured in

adult equivalents, is significantly associated with reduced odds of the household head being educated. In the models of student enrollment for boys and girls in 2010 (models 2 and 3), church membership is also associated with a higher percentage of school-age boys and girls enrolled in school compared with nonmembers. However, in contrast with the education model (model 1), the models for school enrollment show that household head membership in the youngest age-set was significantly negatively associated with the enrollment compared with the older age-sets. Measures of household size or wealth were not significant in any of the models.

Proximity to TNP, measured dichotomously, was significantly positively related to school enrollment for both boys and girls (models 2 and 3). However, the effect was not significant in the model for educational status of the household head (model 1).

DISCUSSION

Taken together, these findings offer strong evidence that: (1) proximity to TNP is positively associated with recent infrastructural development; (2) proximity to TNP is positively associated with diversity of external organizations supporting development, including wildlife-related organizations; (3) the history of development near TNP can be characterized as a transition from unsolicited to solicited development; and (4) proximity to TNP is positively associated with higher school enrollment controlling for other factors. To carry these findings forward my discussion focuses on: (1) the implications of infrastructural development; (2) the bridge these findings provide between qualitative and quantitative analyses of the effects of parks on social outcomes; and (3) the role of parks in manufacturing diversity in the form of unscripted development.

Implications of infrastructural development

Setting aside, for now, the notion that the findings here characterize a type of "unscripted development," evidence of infrastructural development near TNP carries with it several implications for the Tarangire/Simanjiro system, which are pointed to in other studies of pastoralist development. In the short term, increased access to water has been found to reduce

food insecurity and vulnerability to drought where multiple water points and types of points are available to support cattle production (Oluoko-Odingo 2011). In the case of education, higher levels of schooling in pastoralist groups are associated with higher livestock holdings, greater expenditures, better health, and higher savings (Little et al. 2009). In the longer term, there could be negative consequences associated with water development including increased population density and landscape degradation where people and herds are attracted to available water (Fratkin 1997). This may be especially germane where droughts concentrate livestock mobility around limited water. In this way, water points could concentrate degradation in some places, i.e., around points, and reduce pressure in other areas. Negative social and environmental effects, however, will be significantly reduced where social institutions to manage collective resources are in place (Ostrom 1990, Fratkin and Mearns 2003). Further research should explore this as well as the effect of ongoing livelihood diversification, which represents a shift from collective to individual risk management, on communities' capacities for collective action.

Alternatively, a large body of literature coming from development studies and elsewhere has rightfully questioned the benefit of development initiatives throughout the developing world (Kothari 2005). Those critiques may be productive here as well. My project with this study, however, has not been to examine the merit of development in this area, only its incidence, distribution, and the processes by which it evolved. Along these lines, one of the intended goals of these efforts has been to make sense of the seemingly contradictory findings from qualitative and quantitative studies of the effects of parks on people.

Bridging qualitative and quantitative studies

Notably, findings from the analyses presented here are consistent with both economic and ethnographic studies of the effects of parks on people, despite the fact that findings from studies using these two approaches are not typically consistent with each other. Recent studies using sophisticated multivariate approaches have found poverty alleviation near protected areas (Andam et al. 2010, Sims 2010, Barrett et al. 2011, Ferraro et al. 2011, Richardson et al. 2012). Findings from this study, that proximity to TNP is positively associated with development and school enrollment, can be viewed as consistent with findings of poverty alleviation near parks, which each serve as proxies for food security and human well-being. Conversely, a great number of ethnographic studies in cultural anthropology, human geography, and rural sociology have tended to conclude that parks disempower local groups, give rise to insecurity, and promote conflict (Brosius et al. 2005, Brockington et al. 2006, West et al. 2006). These conclusions are arguably consistent with findings here that: (1) development was initially imposed on local communities, both before and after the construction of the park; and (2) that communities' recent pursuit of external support for development projects has been hard fought with many ignored requests, many disappointing collaborations (esp. with wildlife-related organizations), and a lingering and ubiquitous sentiment across local communities that they are not getting their fair share of tourist proceeds. Furthermore, these findings are consistent with other studies from this study area, which found that locals do not perceive there to be benefits associated with living near TNP (Davis 2011) and, in fact, view the park as source of risk in their lives (Baird et al. 2009).

Ultimately, these comparisons offer support for a potential maxim for scholarship on people/park interactions: evidence of conflict and evidence of benefit are not necessarily mutually exclusive. Ethnographic or other qualitative studies that focus on very small samples can miss larger patterns, whereas comparative and statistically representative studies can fail to understand the processes that create pattern. Interestingly, despite decades of research, scholars representing each type of approach have commented that there remains a dearth of quality information of the social impacts of conservation (Brockington et al. 2006, Redford 2011). An important barrier here to improved understanding is an epistemological divide that exists between strictly qualitative and strictly quantitative approaches (Miller et al. 2008) wherein unfamiliar methods are more often viewed for their weaknesses than for their strengths (e.g., Hoffman et al. 2011). Greater efforts must be made to bridge this divide if we are to make meaningful advances in understanding park/people interactions. One strategy here would be to target issues for which qualitative and quantitative approaches have yielded different conclusions and apply mixed methodologies to examine the issues further.

Manufacturing diversity

Toward an improved understanding for the social dynamics of conservation, I submit a speculative but potentially useful new hypothesis here, which attempts to weave together the findings of this study into a broader conceptual orientation: parks manufacture diversity. It is, of course, all too obvious that parks and protected areas are tools to protect a type of diversity, biodiversity. What is much less obvious and has not been sufficiently examined is the effect that parks have on other types of diversity. Although some studies have examined the effect parks have on economic diversification (Nkedianye et al. 2009, Trench et al. 2009, Baird and Leslie 2013), few have looked at diversity at larger scales (Leslie and McCabe 2013). With this study, we find much greater diversity of institutional support for community-level development initiatives near the park compared with communities far from the park; initiatives that were both solicited and unsolicited by the local communities and can be viewed as opportunistic and generally unscripted. As already noted, the concept of "unscripted development" is presented here as a form of shorthand for the idea that development can evolve outside the confines of a grand plan or script as is typical in the case of heralded CBC, CBNRM, or ICDP initiatives. Alternatively, development can evolve from uncoordinated, emergent, often contentious efforts, much the way community structure does in an ecosystem. The argument here is that parks can be drivers, even manufacturers, of this process and must be viewed as such. In other words, diversity can be both a driver of and a product of struggle. In the case of TNP, protecting biodiversity has created struggle in the social-ecological system, an outcome of which is institutional diversity. These feedbacks between diversity and struggle, which cross and recross the divide between social and environmental systems, are central to the dynamics that conservation researchers and policy makers are trying to understand.

Recently, it has been suggested that parks and PAs constitute disturbances in social-ecological systems (Baird and Leslie 2013). The argument here is that by introducing surprise, novelty, uncertainty, risk, and opportunity, parks can undermine or break apart relationships between components in the system.

Furthermore, parks can promote new, diverse, adaptive connections between existing components and even new components recruited to the system. This relationship between disturbance and diversity is observable in both economic (Markowitz 1991, Figge 2004) and ecological contexts (Mackey and Currie 2001, Sheil and Burslem 2003). Therefore, with these issues in mind, what can be the implications of institutional diversity near TNP? The thinking here, as it would be with other systems, is that diversity confers stability, for better or worse. With the Tarangire/Simanjiro system, communities near the park have connected with many organizations to support infrastructural development. Where one organization was unable or unwilling to support a project, communities have been able to solicit other groups. In ecology this is referred to as functional redundancy (Lawton and Brown 1994). Ultimately, the function of financing development projects is borne by many organizations as opposed to one or two, which can be the case in CBC, CBNRM, and ICDP initiatives. Although institutional diversity may offer greater stability in terms of the development process, it is paid for in the form of efficiency. As has been described, communities' efforts in recruiting and managing development support have been hard-fought and contentious.

Although efforts to improve CBC, CBNRM, and ICDP should continue, the implications of an unscripted approach to development in conservation landscapes should be carefully considered as well. In areas like TNP/Simanjiro where external interest is high, policy makers may be well advised to focus on: (1) strengthening community agency and autonomy; and (2) supporting local capacity to negotiate and collaborate with external organizations concerned with development and conservation. Ideally, communities would have opportunities to collaborate with many organizations and organization types, each with different priorities and strategies. The details of community/organization collaborations would be determined locally and would evolve as issues change. Some projects would fail and others would thrive. A diversity of negotiated arrangements and collaborations, some focused on development, others on conservation or hybrid projects, as is seen in the study area, is not efficient in terms of expense or time, but it may confer stability and allow for long-term success.

Responses to this article can be read online at:
<http://www.ecologyandsociety.org/issues/responses.php/6184>

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LITERATURE CITED

- Abbot, J. I. O., D. H. L. Thomas, A. A. Gardner, S. E. Neba, and M. W. Khen. 2001. Understanding the links between conservation and development in the Bamenda Highlands, Cameroon. *World Development* 29:1115-1136.
- Abrams, R. W., E. D. Anwana, A. Ormsby, D. B. K. Dovie, A. Ajagbe, and A. Abrams. 2009. Integrating top-down with bottom-up conservation policy in Africa. *Conservation Biology* 23:799-804. <http://dx.doi.org/10.1111/j.1523-1739.2009.01285.x>
- Adams, W. M., R. Aveling, D. Brockington, B. Dickson, J. Elliott, J. Hutton, D. Roe, B. Vira, and W. Wolmer. 2004. Biodiversity conservation and the eradication of poverty. *Science* 306:1146-1149. <http://dx.doi.org/10.1126/science.1097920>
- Agrawal, A., and C. C. Gibson. 1999. Enchantment and disenchantment: the role of community in natural resource conservation. *World Development* 27:629-649. [http://dx.doi.org/10.1016/S0305-750X\(98\)00161-2](http://dx.doi.org/10.1016/S0305-750X(98)00161-2)
- Agrawal, A., and K. Redford. 2006. *Poverty, development, and biodiversity conservation: shooting in the dark?* Working paper No. 26. Wildlife Conservation Society, New York, New York, USA. [online] URL: http://siteresources.worldbank.org/INTPOVERTYNET/Resources/Agrawal_Redford_WP26.pdf
- Andam, K. S., P. J. Ferraro, K. R. E. Sims, A. Healy, and M. B. Holland. 2010. Protected areas reduced poverty in Costa Rica and Thailand. *Proceedings of the National Academy of Sciences* 107:9996-10001. <http://dx.doi.org/10.1073/pnas.0914177107>
- Angeles, G., D. K. Guilkey, and T. A. Mroz. 2005. The impact of community-level variables on individual-level outcomes. *Sociological Methods & Research* 34:76-121. <http://dx.doi.org/10.1177/0049124104273069>
- Armitage, D. 2005. Adaptive capacity and community-based natural resource management. *Environmental Management* 35:703-715. <http://dx.doi.org/10.1007/s00267-004-0076-z>
- Baird, T. D., and P. W. Leslie. 2013. Conservation as disturbance: upheaval and livelihood diversification near Tarangire National Park, northern Tanzania. *Global Environmental Change* 23:1131-1141. <http://dx.doi.org/10.1016/j.gloenvcha.2013.05.002>
- Baird, T. D., P. W. Leslie, and J. T. McCabe. 2009. The effect of wildlife conservation on local perceptions of risk and behavioral response. *Human Ecology* 37:463-474. <http://dx.doi.org/10.1007/s10745-009-9264-z>
- Baker, J., E. J. Milner-Gulland, and N. Leader-Williams. 2012. Park gazettement and integrated conservation and development as factors in community conflict at Bwindi Impenetrable Forest, Uganda. *Conservation Biology* 26:160-170. <http://dx.doi.org/10.1111/j.1523-1739.2011.01777.x>
- Bandyopadhyay, S., and G. Tembo. 2010. Household consumption and natural resource management around national parks in Zambia. *Journal of Natural Resources Policy Research* 2:39-55. <http://dx.doi.org/10.1080/19390450903350838>
- Barrett, C. B., and P. Arcese. 1995. Are integrated conservation-development projects (ICDPs) sustainable? On the conservation of large mammals in sub-Saharan Africa. *World Development* 23:1073-1084. [http://dx.doi.org/10.1016/0305-750X\(95\)00031-7](http://dx.doi.org/10.1016/0305-750X(95)00031-7)

- Barrett, C. B., A. J. Travis, and P. Dasgupta. 2011. On biodiversity conservation and poverty traps. *Proceedings of the National Academy of Sciences* 108:13907-13912. <http://dx.doi.org/10.1073/pnas.1011521108>
- Berkes, F. 2004. Rethinking community-based conservation. *Conservation Biology* 18:621-630. <http://dx.doi.org/10.1111/j.1523-1739.2004.00077.x>
- Bernard, H. R. 2006. *Research methods in anthropology: qualitative and quantitative approaches*. Fourth edition. Alta Mira Press, New York, New York, USA.
- Blaikie, P. 2006. Is small really beautiful? Community-based natural resource management in Malawi and Botswana. *World Development* 34:1942-1957. <http://dx.doi.org/10.1016/j.worlddev.2005.11.023>
- Brandon, K., K. Redford, and S. Sanderson, editors. 1998. *Parks in peril: people, politics, and protected areas*. Island, Washington, D.C., USA.
- Brandon, K. E., and M. Wells. 1992. Planning for people and parks: design dilemmas. *World Development* 20:557-570. [http://dx.doi.org/10.1016/0305-750X\(92\)90044-V](http://dx.doi.org/10.1016/0305-750X(92)90044-V)
- Brechin, S. R., P. R. Wilshusen, C. L. Fortwangler, and P. C. West. 2002. Beyond the square wheel: toward a more comprehensive understanding of biodiversity conservation as social and political process. *Society & Natural Resources* 15:41-64. <http://dx.doi.org/10.1080/089419202317174011>
- Brockington, D. 2004. Community conservation, inequality and injustice: myths of power in protected area management. *Conservation & Society* 2:411-432.
- Brockington, D. 2007. Forests, community conservation, and local government performance: the village forest reserves of Tanzania. *Society & Natural Resources* 20:835-848. <http://dx.doi.org/10.1080/08941920701460366>
- Brockington, D., R. Duffy, and J. Igoe. 2008. Nature unbound: conservation, capitalism, and the future of protected areas. Earthscan, London, UK.
- Brockington, D., and J. Igoe. 2006. Eviction for conservation. A global overview. *Conservation & Society* 4:424-470.
- Brockington, D., J. Igoe, and K. Schmidt-Soltau. 2006. Conservation, human rights, and poverty reduction. *Conservation Biology* 20:250-252. <http://dx.doi.org/10.1111/j.1523-1739.2006.00335.x>
- Brosius, J. P., A. L. Tsing, and C. Zerner, editors. 2005. *Communities and conservation: histories and politics of community-based natural resource management*. Altamira Press, Walnut Creek, California, USA.
- Campbell, L. M., and A. Vainio-Mattila. 2003. Participatory development and community-based conservation: opportunities missed for lessons learned? *Human Ecology* 31:417-437. <http://dx.doi.org/10.1023/A:1025071822388>
- Cernea, M. M., and K. Schmidt-Soltau. 2006. Poverty risks and national parks: policy issues in conservation and resettlement. *World Development* 34:1808-1830. <http://dx.doi.org/10.1016/j.worlddev.2006.02.008>
- Child, B., editor. 2004. *Parks in transition: biodiversity, rural development and the bottom line*. Earthscan, London, UK.
- Child, B., and G. Barnes. 2010. The conceptual evolution and practice of community-based natural resource management in southern Africa: past, present and future. *Environmental Conservation* 37:283-295. <http://dx.doi.org/10.1017/S0376892910000512>
- Cooke, A. E. 2007. *Subdividing the savanna: the ecology of change in Northern Tanzania*. Dissertation. University of North Carolina, Chapel Hill, North Carolina, USA.
- Coomes, O. T., B. L. Barham, and Y. Takasaki. 2004. Targeting conservation-development initiatives in tropical forests: insights from analyses of rain forest use and economic reliance among Amazonian peasants. *Ecological Economics* 51:47-64. <http://dx.doi.org/10.1016/j.ecolecon.2004.04.004>
- Davis, A. 2011. 'Ha! What is the benefit of living next to the park?' Factors limiting in-migration next to Tarangire National Park, Tanzania. *Conservation & Society* 9:25-34. <http://dx.doi.org/10.4103/0972-4923.79184>
- Dowie, M. 2009. *Conservation refugees*. MIT Press, Cambridge, Massachusetts, USA.
- Ferraro, P. J., and M. M. Hanauer. 2011. Protecting ecosystems and alleviating poverty with parks and reserves: 'win-win' or tradeoffs? *Environmental and Resource Economics* 48:269-286. <http://dx.doi.org/10.1007/s10640-010-9408-z>
- Ferraro, P. J., M. M. Hanauer, and K. R. E. Sims. 2011. Conditions associated with protected area success in conservation and poverty reduction. *Proceedings of the National Academy of Sciences* 108:13913-13918. <http://dx.doi.org/10.1073/pnas.1011529108>
- Figge, F. 2004. Bio-folio: applying portfolio theory to biodiversity. *Biodiversity and Conservation* 13:827-849. <http://dx.doi.org/10.1023/B:BIOC.0000011729.93889.34>
- Fratkin, E. 1997. Pastoralism: governance and development issues. *Annual Review of Anthropology* 26:235-261. <http://dx.doi.org/10.1146/annurev.anthro.26.1.235>
- Fratkin, E., and R. Mearns. 2003. Sustainability and pastoral livelihoods: lessons from East African Maasai and Mongolia. *Human Organization* 62:112-122.
- Garnett, S. T., J. Sayer, and J. du Toit. 2007. Improving the effectiveness of interventions to balance conservation and development: a conceptual framework. *Ecology and Society* 12 (1): 2. [online] URL: <http://www.ecologyandsociety.org/vol12/iss1/art2/>
- Goldman, M. 2003. Partitioned nature, privileged knowledge: community-based conservation in Tanzania. *Development and Change* 34:833-862. <http://dx.doi.org/10.1111/j.1467-7660.2003.00331.x>
- Goldman, M. 2011. Strangers in their own land: Maasai and wildlife conservation in northern Tanzania. *Conservation & Society* 9:65-79. <http://dx.doi.org/10.4103/0972-4923.79194>
- Greiner, C. 2012. Unexpected consequences: wildlife conservation and territorial conflict in northern Kenya. *Human Ecology* 40:415-425. <http://dx.doi.org/10.1007/s10745-012-9491-6>

- Hackel, J. 1999. Community conservation and the future of Africa's wildlife. *Conservation Biology* 13:726-734. <http://dx.doi.org/10.1046/j.1523-1739.1999.98210.x>
- Haley, M., and A. Clayton. 2003. The role of NGOs in environmental policy failures in a developing country: the mismanagement of Jamaica's coral reefs. *Environmental Values* 12:29-54. <http://dx.doi.org/10.3197/096327103129341216>
- Hodgson, D. L. 2005. *The church of women*. Indiana University Press, Bloomington, Indiana, USA.
- Hoffman, D., D. Fay, and L. Joppa. 2011. Human migration to protected area edges in Africa and Latin America: questioning large-scale statistical analysis. *Conservation & Society* 9:1-7. <http://dx.doi.org/10.4103/0972-4923.79177>
- Homewood, K., P. Kristjanson, and P. C. Trench, editors. 2009. *Staying Maasai?: Livelihoods, conservation and development in East African rangelands*. Springer, New York, New York, USA. <http://dx.doi.org/10.1007/978-0-387-87492-0>
- Homewood, K. M., and W. A. Rodgers. 1991. *Maasailand ecology: pastoralist development and wildlife conservation in Ngorongoro, Tanzania*. Revised edition. Cambridge University Press, Cambridge, UK. <http://dx.doi.org/10.1017/CBO9780511525568>
- Igoe, J. 2002. National parks and human ecosystems: the challenge to community conservation. A case study from Simanjiro Tanzania. Pages 77-96 in D. Chatty and M. Colchester, editors. *Conservation and mobile indigenous peoples*. Berghahn Books, New York, New York, USA.
- Igoe, J. 2003. Scaling up civil society: donor money, NGOs and the pastoralist land rights movement in Tanzania. *Development and Change* 34:863-885. <http://dx.doi.org/10.1111/j.1467-7660.2003.00332.x>
- Jones, B. T. B., and M. Murphree. 2004. Community-based natural resource management as a conservation mechanism: lessons and direction. Pages 63-103 in B. Child, editor. *Parks in transition*. Earthscan, London, UK.
- Kothari, U., editor. 2005. *A radical history of development studies: individuals, institutions and ideologies*. Zed Books, London, UK.
- Kremen, C., A. M. Merenlender, and D. D. Murphy. 1994. Ecological monitoring: a vital need for integrated conservation and development programs in the tropics. *Conservation Biology* 8:388-397. <http://dx.doi.org/10.1046/j.1523-1739.1994.08020388.x>
- Lawton, J. H., and V. K. Brown. 1994. Redundancy in ecosystems. Pages 255-270 in E. D. Schulze and H. A. Mooney, editors. *Biodiversity and ecosystem function*. Springer, Berlin, Germany. http://dx.doi.org/10.1007/978-3-642-58001-7_12
- Leatherman, C. 2008. The poverty question. *Nature Conservancy* 58(1):42-51.
- Leslie, P., and J. T. McCabe. 2013. Response diversity and resilience in social-ecological systems. *Current Anthropology* 54:114-143. <http://dx.doi.org/10.1086/669563>
- Levine, A. 2002. Convergence or convenience? International conservation NGOs and development assistance in Tanzania. *World Development* 30:1043-1055. [http://dx.doi.org/10.1016/S0305-750X\(02\)00022-0](http://dx.doi.org/10.1016/S0305-750X(02)00022-0)
- Little, P. D., A. A. Aboud, and C. Lenachuru. 2009. Can formal education reduce risks for drought-prone pastoralists?: A case study from Baringo District, Kenya. *Human Organization* 68:154-165.
- Mackey, R. L., and D. J. Currie. 2001. The diversity-disturbance relationship: is it generally strong and peaked? *Ecology* 82:3479-3492.
- Markowitz, H. M. 1991. Foundations of portfolio theory. *Journal of Finance* 46:469-477. <http://dx.doi.org/10.1111/j.1540-6261.1991.tb02669.x>
- Martin, J., P. L. Fackler, J. D. Nichols, M. C. Runge, C. L. McIntyre, B. L. Lubow, M. C. McCluskie, and J. A. Schmutz. 2011. An adaptive-management framework for optimal control of hiking near Golden Eagle nests in Denali National Park. *Conservation Biology* 25:316-323.
- Mbaiwa, J. E., A. Stronza, and U. Kreuter. 2011. From collaboration to conservation: insights from the Okavango Delta, Botswana. *Society & Natural Resources* 24:400-411. <http://dx.doi.org/10.1080/08941921003716745>
- McCabe, J. T. 1992. Can conservation and development be coupled among pastoral people? An examination of the Maasai of the Ngorongoro Conservation Area, Tanzania. *Human Organization* 51:353-366.
- McCabe, J. T., P. W. Leslie, and L. DeLuca. 2010. Adopting cultivation to remain pastoralists: the diversification of Maasai livelihoods in northern Tanzania. *Human Ecology* 38:321-334. <http://dx.doi.org/10.1007/s10745-010-9312-8>
- Miller, T. R., T. D. Baird, C. M. Littlefield, G. Kofinas, F. Chapin, III, and C. L. Redman. 2008. Epistemological pluralism: rethinking interdisciplinary research. *Ecology and Society* 13(2): 46. [online] URL: <http://www.ecologyandsociety.org/vol13/iss2/art46/>
- Morgan-Brown, T., S. K. Jacobson, K. Wald, and B. Child. 2010. Quantitative assessment of a Tanzanian integrated conservation and development project involving butterfly farming. *Conservation Biology* 24:563-572. <http://dx.doi.org/10.1111/j.1523-1739.2009.01433.x>
- Naughton-Treves, L., J. Alix-Garcia, and C. A. Chapman. 2011. Lessons about parks and poverty from a decade of forest loss and economic growth around Kibale National Park, Uganda. *Proceedings of the National Academy of Sciences* 108:13919-13924. <http://dx.doi.org/10.1073/pnas.1013332108>
- Naughton-Treves, L., M. B. Holland, and K. Brandon. 2005. The role of protecting areas in conserving biodiversity and sustaining local livelihoods. *Annual Review of Environment and Resources* 30:219-252. <http://dx.doi.org/10.1146/annurev.energy.30.050504.164507>
- Nelson, F., and A. Agrawal. 2008. Patronage or participation? Community-based natural resource management reform in sub-Saharan Africa. *Development and Change* 39:557-585. <http://dx.doi.org/10.1111/j.1467-7660.2008.00496.x>

- Nelson, F., C. Foley, L. Foley, A. Leposo, E. Loure, D. Peterson, M. Peterson, T. Peterson, H. Sachedina, and A. Williams. 2010. Payments for ecosystem services as a framework for community-based conservation in northern Tanzania. *Conservation Biology* 24:78-85. <http://dx.doi.org/10.1111/j.1523-1739.2009.01393.x>
- Nelson, F., R. Nshala, and W. Rodgers. 2007. The evolution and reform of Tanzanian wildlife management. *Conservation & Society* 5:232-261.
- Neumann, R. P. 1998. *Imposing wilderness: struggles over livelihood and nature preservation in Africa*. University of California Press, Berkeley, California, USA.
- Newmark, W. D., and J. L. Hough. 2000. Conserving wildlife in Africa: integrated conservation and development projects and beyond. *BioScience* 50:585-592. [http://dx.doi.org/10.1641/0006-3568\(2000\)050\[0585:CWIAIC\]2.0.CO;2](http://dx.doi.org/10.1641/0006-3568(2000)050[0585:CWIAIC]2.0.CO;2)
- Nkedianye, D., M. Radeny, P. Kristjanson, and M. Herrero. 2009. Assessing returns to land and changing livelihood strategies in Kitemba. Pages 115-149 in K. Homewood, P. Kristjanson, and P. C. Trench, editors. *Staying Maasai?: Livelihoods, conservation and development in East African rangelands*. Springer, New York, New York, USA. http://dx.doi.org/10.1007/978-0-387-87492-0_4
- Olson, D. M., and E. Dinerstein. 1998. The global 200: a representation approach to conserving the Earth's most biologically valuable ecoregions. *Conservation Biology* 12:502-515. <http://dx.doi.org/10.1046/j.1523-1739.1998.012003502.x>
- Oluoko-Odingo, A. A. 2011. Vulnerability and adaptation to food insecurity and poverty in Kenya. *Annals of the Association of American Geographers* 101:1-20. <http://dx.doi.org/10.1080/0004-5608.2010.532739>
- Ostrom, E. 1990. *Governing the commons: the evolution of institutions for collective action*. Cambridge University Press, Cambridge, UK. <http://dx.doi.org/10.1017/CBO9780511807763>
- Peters, J. 1998. Transforming the integrated conservation and development project (ICDP) approach: observations from the Ranomafana National Park Project, Madagascar. *Journal of Agricultural and Environmental Ethics* 11:17-47. <http://dx.doi.org/10.1023/A:1007796628731>
- Redford, K. H. 2011. Misreading the conservation landscape. *Oryx* 45:324-330. <http://dx.doi.org/10.1017/S0030605311000019>
- Richardson, R. B., A. Fernandez, D. Tschirley, and G. Tembo. 2012. Wildlife conservation in Zambia: impacts on rural household welfare. *World Development* 40:1068-1081. <http://dx.doi.org/10.1016/j.worlddev.2011.09.019>
- Sachedina, H. T. 2008. *Wildlife is our oil: conservation, livelihoods and NGOs in the Tarangire Ecosystem, Tanzania*. Oxford University Press, Oxford, UK.
- Sachedina, H. T. 2010. Disconnected nature: the scaling up of African wildlife foundation and its impacts on biodiversity conservation and local livelihoods. *Antipode* 42:603-623. <http://dx.doi.org/10.1111/j.1467-8330.2010.00765.x>
- Sachedina, H., and F. Nelson. 2010. Protected areas and community incentives in savannah ecosystems: a case study of Tanzania's Maasai Steppe. *Oryx* 44:390-398. <http://dx.doi.org/10.1017/S0030605310000499>
- Sellen, D. W. 2003. Nutritional consequences of wealth differentials in East African pastoralists: the case of the Datoga of northern Tanzania. *Human Ecology* 31(4):529-570. <http://dx.doi.org/10.1023/b:huec.0000005513.78183.34>
- Serneels, S., M. Herrero, S. BurnSilver, P. C. Trench, K. Cochrane, K. Homewood, P. Kristjanson, F. Nelson, M. Radeny, D. M. Thompson, and M. Y. Said. 2009. Methods in the analysis of Maasai livelihoods. Pages 43-67 in K. Homewood, P. Kristjanson, and P. C. Trench, editors. *Staying Maasai?: Livelihoods, conservation and development in East African rangelands*. Springer, New York, New York, USA. http://dx.doi.org/10.1007/978-0-387-87492-0_2
- Sheil, D., and D. F. R. P. Burslem. 2003. Disturbing hypotheses in tropical forests. *Trends in Ecology & Evolution* 18:18-26. [http://dx.doi.org/10.1016/S0169-5347\(02\)00005-8](http://dx.doi.org/10.1016/S0169-5347(02)00005-8)
- Sheppard, D. J., A. Moehrensclager, J. M. McPherson, and J. J. Mason. 2010. Ten years of adaptive community-governed conservation: evaluating biodiversity protection and poverty alleviation in a West African hippopotamus reserve. *Environmental Conservation* 37:270-282. <http://dx.doi.org/10.1017/S037689291000041X>
- Sims, K. R. E. 2010. Conservation and development: evidence from Thai protected areas. *Journal of Environmental Economics and Management* 60:94-114. <http://dx.doi.org/10.1016/j.jeem.2010.05.003>
- Tallis, H., P. Kareiva, M. Marvier, and A. Chang. 2008. An ecosystem services framework to support both practical conservation and economic development. *Proceedings of the National Academy of Sciences* 105:9457-9464. <http://dx.doi.org/10.1073/pnas.0705797105>
- Trench, P. C., S. Kiruswa, F. Nelson, and K. Homewood. 2009. Still "People of Cattle"? Livelihoods, diversification and community conservation in Longido District. Pages 217-256 in K. Homewood, P. Kristjanson, and P. C. Trench, editors. *Staying Maasai?: Livelihoods, conservation and development in East African rangelands*. Springer, New York, New York, USA. http://dx.doi.org/10.1007/978-0-387-87492-0_6
- Wainwright, C., and W. Wehrmeyer. 1998. Success in integrating conservation and development? A study from Zambia. *World Development* 26:933-944. [http://dx.doi.org/10.1016/S0305-750X\(98\)00027-8](http://dx.doi.org/10.1016/S0305-750X(98)00027-8)
- Waylen, K. A., A. Fischer, P. J. K. McGowan, S. J. Thirgood, and E. J. Milner-Gulland. 2010. Effect of local cultural context on the success of community-based conservation interventions. *Conservation Biology* 24:1119-1129. <http://dx.doi.org/10.1111/j.1523-1739.2010.01446.x>
- Wells, M. P., and T. O. McShane. 2004. Integrating protected area management with local needs and aspirations. *AMBIO: A Journal of the Human Environment* 33:513-519.

West, P., and D. Brockington. 2006. An anthropological perspective on some unexpected consequences of protected areas. *Conservation Biology* 20:609-616. <http://dx.doi.org/10.1111/j.1523-1739.2006.00432.x>

West, P., J. Igoe, and D. Brockington. 2006. Parks and peoples: the social impact of protected areas. *Annual Review of Anthropology* 35:251-277. <http://dx.doi.org/10.1146/annurev.anthro.35.081705.123308>

Wilkie, D. S., G. A. Morelli, J. Demmer, M. Starkey, P. Telfer, and M. Steil. 2006. Parks and people: assessing the human welfare effects of establishing protected areas for biodiversity conservation. *Conservation Biology* 20:247-249. <http://dx.doi.org/10.1111/j.1523-1739.2005.00291.x>

Yasuda, A. 2011. The impacts of sport hunting on the livelihoods of local people: a case study of Bénoué National Park, Cameroon. *Society & Natural Resources* 24:860-869. <http://dx.doi.org/10.1080/08941920.2010.486394>