

# THE ROLE OF CONSERVATION RESEARCH AND EDUCATION CENTERS IN GROWING NATURE-BASED TOURISM

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**ABSTRACT**—There are increasing numbers of private (nonprofit and for-profit) centers that carry out conservation research and education in locations of environmental concern. Such centers generate revenue streams that directly support conservation programs and also sustain surrounding human communities. This paper assesses the size of the centers' economic impacts. We conducted separate studies of the economic impacts of the Cheetah Conservation Fund (Namibia) and (jointly) the Rowe Bird Sanctuary and Whooping Crane Trust (central Nebraska, USA). We collected data on direct expenditures and surveyed visitors and volunteers on their spending. For the Cheetah Conservation Fund, we estimate total economic impact using a Social Accounting Matrix developed for Namibia to determine appropriate multipliers. For the Rowe Sanctuary and the Whooping Crane Trust, we employ the IMPLAN Pro modeling software. We find that the Cheetah Conservation Fund generates a total economic impact of US\$4.13 million per year and Rowe Sanctuary/Whooping Crane Trust generates US\$3.80 million annually; the former sustains 177 jobs and the latter creates 63 jobs. Are such impacts significant? Two considerations suggest they are. First, such centers tend to be located in remote, usually rural areas where even small impacts may be important in sustaining local human communities. Second, for Africa alone we identified some 352 active conservation centers (undoubtedly a large undercount), so if on average each had an economic impact equal to that of Cheetah Conservation Fund, their combined impact would total about \$1.5 billion per year.

**Key Words:** cheetah, conservation, economic impact, ecotourism, education center, research center, Rowe, whooping crane

## INTRODUCTION

Rising global environmental consciousness has provided support for establishing a growing number of centers, institutes, foundations, and other organizations (referred to herein as “centers”) to carry out research and education as well as outreach and advocacy. Such centers play a crucial role in supporting habitat conservation in grasslands around the world. They develop new knowledge about grassland ecology and species, and

their education, outreach, and advocacy programs raise consciousness both locally and globally about conserving grasslands and their biodiversity. But centers also support grassland conservation by generating revenue streams—revenues that not only support conservation programs but also sustain surrounding human communities, both of which can help to preserve grasslands.

Centers receive grant support for research and education; they cultivate donors and foundations for funds; and they may also derive revenue from tourism. Some

obtain revenue from volunteers and students who come to work at the research and education centers and who may even pay tuition to volunteer. Such monies can form a significant share of “tourism” revenue. Volunteers and students can also account for a meaningful share of the offsite spending in the community, which accentuates the impact of other nature-based tourism on the local economy.

This study examines the economic impact that results from three grassland conservation organizations that are focused on research and education. We study the impact of the Cheetah Conservation Fund in Namibia and (jointly) the Lillian Annette Rowe Bird Sanctuary and the nearby Platte River Whooping Crane Maintenance Trust in the Great Plains.

Why focus on *research-* and *education-*related conservation centers? As we explore below, the economic impact of these centers has been little studied. Moreover, casual observation suggests that what we term “eco-engagement”—not just journeying to nature reserves to view and photograph (or hunt) exotic flora and fauna but more self-consciously to *learn about biodiversity* and even *contribute to its conservation*—is becoming a larger element in world ecotourism revenues. And as we find in one study reported below, the spending associated with such eco-engagement, in the form of tuition paid by volunteers to intern at a center and offsite spending by the volunteers and interns, constitutes a significant part of the center’s economic impact.

## PREVIOUS STUDIES OF ECONOMIC IMPACT

### Southwestern Africa Context

In Namibia and South Africa, conservationists and entrepreneurs established many game farms, private game preserves, private and communal conservancies, nature reserves, and other similar sites—what may be called private protected areas—during the last 25 years. Scholars have produced a small but growing body of literature about the economic effects of these projects. Private protected areas are an important complement to the extensive national parks and other state-owned or publicly protected areas in Africa; for example, such private areas add as much as 14% of the total Namibian land surface to that country’s protected areas (Turpie et al. 2004). Private protected areas have a diversity of goals: some are primarily for-profit entities, others are intended to facilitate or stimulate tourism, and still others are predominantly focused on the conservation and regeneration of species

and ecosystems. At least one study (Langholz 1996:276) found that for all types of private nature reserves, operators were “motivated more by conservation goals than by personal or economic objectives.”

These diverse nonstate organizations advance local environmental goals and respond to international interest in preserving grassland species and ecosystems. Krug (2001), for example, found that global willingness to pay to set up preserves is greater than local willingness to pay, creating an opening for donor-funded centers. Further, in developing game farms and nature reserves, Namibia and other African countries are increasingly able to convert opportunities for trophy hunting, photographic safaris, and international interest in preserving African grasslands into economic growth opportunities, increasing their gross domestic product, employment, and earnings.

Research in Namibia and elsewhere in Africa has identified substantial economic impacts from reserves and conservancies. Krug (2001) estimated that the overall benefit to Namibia from private conservancies and game ranches in 1996 was US\$78 million. Weaver and Skyer (2003) estimated that individuals who participated in the fledgling Community-Based Natural Resource Management conservancies established under 1996 legislation in Namibia already had realized annual benefits exceeding US\$1.1 million by 2002. In addition, this program also resulted in substantial conservation gains in the form of increases in the populations of many species.

In a major study of the economic impact of state-owned (or national) protected areas, Turpie et al. (2004) estimated that in 2003 Namibia earned large benefits—on the order of US\$135 million to US\$270 million added to its gross domestic product—from nature-based tourism. Using estimates of the total number of protected-area visitors of between 214,028 and 382,439, the per-visitor GDP contribution may be estimated as between US\$324 to US\$1,050. Langholz (1996) found that the average visitor in 1993 spent approximately US\$91 at a conservancy or reserve, not including travel costs to the establishment.

Langholz and Kerley (2006) studied 10 private game reserves in the eastern Cape region of South Africa and found that on average each reserve supported 107 full-time employees, with an additional 375 family members dependent on the full-time employees. Moreover, jobs at the reserves tended to pay much higher wages, with wages on reserves being on average 4.8 times the wages that agricultural workers received before conversion from agriculture to game farming.

Weaver and Skyer (2003) examined the Nyae Nyae Conservancy and Khaudum Game Reserve for their

potential economic contribution to a single area. Using natural life cycle estimates, they showed that at only 25% capacity, this area in Namibia could produce an estimated benefit of US\$1.57 million per year by 2015. Barnes et al. (2001) found all five of the communal conservancies they examined to be net contributors to the national economy, with net value-added contributions (in 2000) ranging from US\$37,149 to US\$109,442.

Obviously some conservancies were more successful than the others. The authors found that a big factor in the success of a conservancy was the preexisting presence of a natural wildlife population, which eliminated the cost of investing in stocking the reserve.

Private conservancies tend to have much larger budgets than the publicly run parks. Krug (2001), for example, found average spending to be US\$5 per square kilometer for public parks and US\$74 for the “semiprivate” parks. Finally, Mbaiwa (2003), in a study of tourism in the Okavango Delta of Botswana, argued that “enclave tourism”—that is, tourism in a context where foreigners own the safari companies and tourism facilities—could result in little benefit to the local economy.

The above results suggest that conservancies, including private conservancies, make a substantial positive economic impact. However, the size of this impact, including its effect on the immediately surrounding communities, is not well measured, especially for the private conservancies and even more particularly for those that are primarily research- and education-oriented.

Conservancies’ revenues in Africa mainly derive from three sources: tourism, trophy hunting, and game-meat sales. Among eight African and 24 Latin American conservancies that Langholz (1996) studied, overall revenue in 1993 from tourism was 67% of their total revenue, and roughly one-third of the conservancies he surveyed stated that 100% of their income was based on tourism. In Krug’s (2001) study, nature tourism ranked among the top three contributors to GDP in most eastern and southern African nations.

In the only study we could locate that examined the economic impact of a research and education center, Blorn (2000) studied the remote Dzanga-Sangha protected area complex in the Central African Republic. The Dzanga-Sangha protected area impacts the surrounding location through its direct expenditures (in 1998 it had total direct expenditures of US\$520,270) and through tourism (estimated to contribute US\$36,228 in 1998). The author attempted no multiplier analysis (see “Methods” for a discussion of multipliers) to assess the conservancy’s overall impact on the Central African Republic’s economy.

## Great Plains Context

The economic benefits generated by nature-based tourism in North America, including the Great Plains, also have been studied, but again little work has been done on the impact of research and education centers.

Hunting and fishing activities traditionally have generated the most nature-based revenues (about 73% in 2006, for example). But the category of wildlife viewers may be of particular interest because it is the most rapidly growing category in terms of numbers of participants (U.S. Fish and Wildlife Service 1991, 2006) and because it may hold the most potential for economic growth. For example, to assess the economic development potential of birding in North Dakota, Hodur et al. (2005) surveyed participants at the Potholes and Prairies Birding Festival in 2004. They found that the festival attracted mostly out-of-local-area participants who spent an average of roughly 3.2 nights and \$102.80 per person per day in the immediate area. This level of spending was considerably higher than spending by in-state-only participants (\$44.69) at the Stork and Cork Festival in 2006 in Mississippi (Measells and Grado 2007).

The economic impact of tourists who come to central Nebraska to view the sandhill cranes (*Grus canadensis*) has been assessed several times, most notably by Gary Lingle (1992) and consulting company Fermata Inc. (1998). Lingle used vehicle counters, questionnaires, and tabulations of various facilities’ visitor logs to estimate both the number of visitors and their economic impact. He counted vehicles passing in both directions on a section of the Platte River Road southwest of Grand Island. He assumed that roughly 83% (10,000 out of a total of 12,002 vehicles) were “bona fide” crane watchers. He further assumed that crane-watcher vehicles carried an average of four persons, yielding a total of 40,000 crane watchers. To account for crane watchers who visited crane-watching areas other than his study location, he doubled the estimate to 80,000 crane watchers.

Lingle then drew upon the results of a different survey of 350 respondents, which revealed that crane watchers stayed an average of 2.7 days in the region and spent \$69.23 per person per day. He multiplied his 80,000 crane watchers by 2.7 days per visitor and by \$69.23 spending per day to reach his estimate of nearly \$15 million in crane-watcher-generated spending. Lingle did not separate the spending of visitors who lived within the region from that of visitors who lived outside the region, nor did he consider whether visitors to central Nebraska came primarily to view the crane migration or for other reasons,

nor did he correct his estimate of new retail spending to include only the “markup” portion. He applied a Nebraska Department of Economic Development local-area multiplier of 1.8, which when applied to the \$15 million resulted in his estimate of a total local-area economic impact of \$27 million.

The Fermata company defined a Middle Platte River Study Area, a 130-kilometer segment of the river stretching from Columbus, NE, to North Platte, NE. From surveys, Fermata estimated that in 1996 between 14,500 and 22,715 tourists from outside the region arrived in the area to watch cranes. Travelers who resided in Nebraska but outside the study area stayed longer and spent more per day than local residents, and out-of-state crane watchers stayed the longest and spent the most. In a feature often missed in public discussion of Fermata’s results, Fermata estimated the economic impact of the crane watchers’ spending on any bird-watching activities throughout the entire year. It found that the annual economic impact of wildlife watching on the Platte River was between \$25.1 million and \$37.4 million.

Fermata recognized that Lingle’s estimates of the number of visitors were likely too high and that Lingle failed to distinguish outside-the-region visitors from within-region visitors. Through its own surveys Fermata developed estimates of outside-the-region visitors. Fermata (1998:40) explained the difference as follows:

Lingle based his estimate, in large part, on traffic counts. One would expect that most of Lingle’s visitors were “day-trippers,” small groups out for a day’s drive to see the cranes. For [our] survey, the number of “day-trippers” along the Platte was considered the difference between [our] study’s nature tourist estimate (14,500 to 22,715) and Lingle’s 80,000 “crane watchers”; that is, roughly 60,000 “day-trippers.”

Thus Fermata also adopted Lingle’s speculative estimate of 80,000 visitors, but it interpreted that number as including 60,000 day-trippers.

Fermata estimated that crane watchers spent an average of 7.04 days annually within the study area on bird watching. It used this figure to calculate total crane-watcher days; this adjustment effectively transformed the study from one of crane watchers to one of bird watchers generally. Unfortunately, the figure of 7.04 days per year was improperly constructed using 259 within-region respondents as well as 736 outside-region respondents. Within-region respondents spent many more days in their

own region on bird watching (14.7 days per year) than outside-region respondents spent in the study area (4.4 days), so their inclusion inflated the average. The total of bird-watching days was then multiplied by \$79.48, the average per-day spending by outside-region visitors.

Fermata failed to correct retail spending to include only the markup portion. Further, without evidence it assumed that all outside-region visitors were primarily in central Nebraska for crane viewing, rather than for other purposes.

In our judgment, both the Lingle and Fermata studies have methodological and other weaknesses that result in substantial overestimates of the impact of crane watching. We found no studies that assessed the impact specifically of Great Plains-based research and education centers similar to the ones we studied.

## METHODS

We conducted two studies to assess the economic impacts of research and education centers. The first study was at the Cheetah Conservation Fund in Namibia. The second study was at the Rowe Bird Sanctuary and Platte River Whooping Crane Trust, both of which are located in central Nebraska.

### Study Site 1: Cheetah Conservation Fund

The Cheetah Conservation Fund ([www.cheetah.org](http://www.cheetah.org)) is a nongovernmental, nonprofit organization whose mission is to be an internationally recognized center of excellence in research and education on cheetahs (*Acinonyx jubatus*) and their ecosystems. The Cheetah Conservation Fund works to improve census and monitoring techniques and long-term conservation strategies; develop and implement better livestock management practices (eliminating the need for farmers to kill cheetahs); conduct conservation education programs for local villagers, farmers, and schoolchildren; and continue intensive scientific research in cheetah genetics, biology, human-cheetah interactions, and species survival. It pioneered the Livestock Guarding Dog program in which dogs are specially bred and trained and then placed with local farmers to guard livestock from predators.

The Cheetah Conservation Fund has located its headquarters, including research facilities, an educational center, land conservancy, and other associated facilities, near Otjiwarongo, Namibia, Africa (Fig. 1). Locally, the Cheetah Conservation Fund teaches farmers and others from the surrounding community.



Figure 1. Map of Namibia, showing location of Cheetah Conservation Fund. Map by Stephen Lavin.

Globally, it works to raise awareness of the precarious state of wild cheetah populations and of conservation efforts that are needed to ensure the cheetah's future. It

has affiliates, trusts, branches, and programs in a number of other countries, but these are not included within the scope of this study.

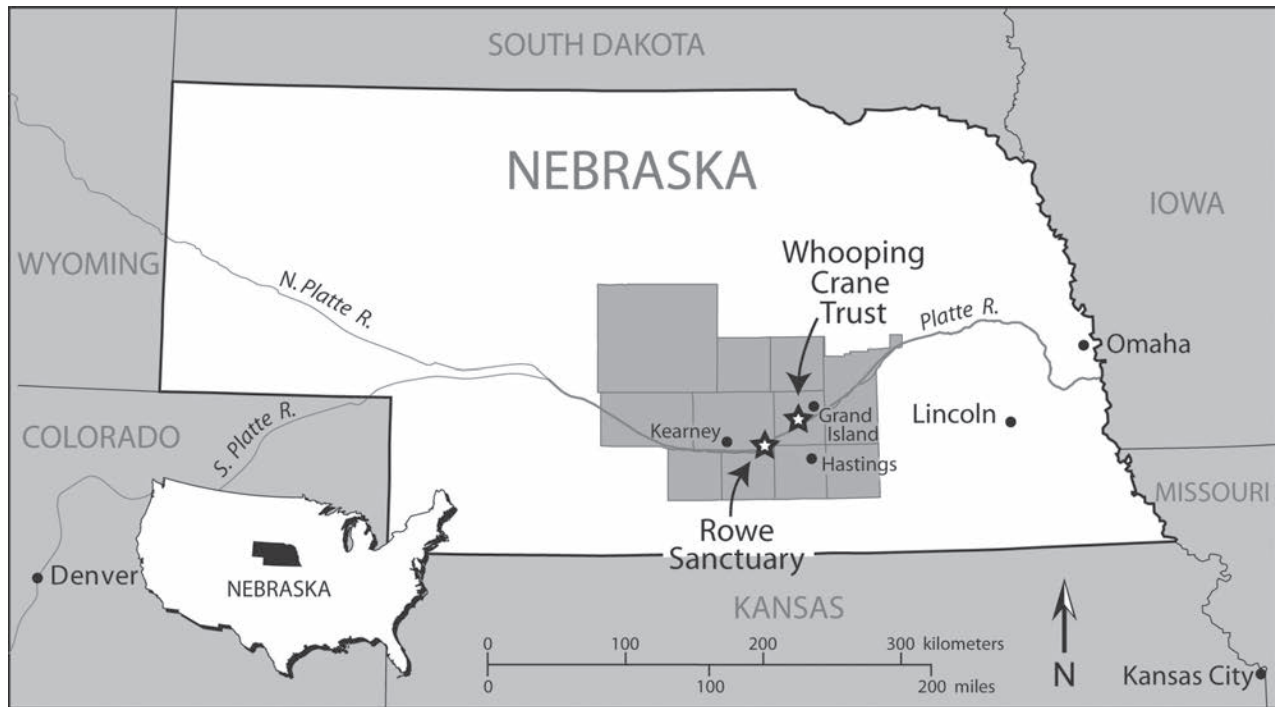


Figure 2. Map of Nebraska, showing location of Rowe Bird Sanctuary and Whooping Crane Trust. Map by Stephen Lavin.

### Study Site 2: Rowe Bird Sanctuary and Platte River Whooping Crane Trust

Among the charismatic species of the Great Plains, such as bison (*Bison bison*) and perhaps prairie dogs (*Cynomys* spp.), are sandhill cranes. Migrating cranes stop along the Platte River after the long trek from overwintering sites in the American Southwest or northern Mexico; they spend several weeks resting and refueling for the next part of their trip, to their breeding grounds in the northern Canada, Russia, Alaska, and elsewhere. As Jane Goodall (2008) observed at the “Rivers and Wildlife Celebration” in Kearney, NE, “The annual migration of the sandhill cranes is one of the seven wonders of the natural world.” Their migration attracts tens of thousands of bird watchers in March and early April to the Grand Island-Hastings-Kearney region of central Nebraska.

The Rowe Bird Sanctuary ([www.rowsanctuary.org](http://www.rowsanctuary.org)) and the Platte River Whooping Crane Trust ([www.whoopingcrane.org](http://www.whoopingcrane.org)) are separate organizations, but for purposes of this study we consider them jointly as a research and education “cluster” (Fig. 2). Both organizations focus on conserving and restoring bird habitat, especially along that short stretch of the Platte River that is crucial to the half-million-strong annual migration of the sandhill cranes and to the small surviving population of whooping

cranes (*Grus americana*). Both organizations own and manage critical habitat. And although both centers carry out research and education functions, Rowe Sanctuary plays a major role in organizing and hosting the large numbers of tourists who come to see the cranes (which the Whooping Crane Trust does not). However, the Trust is more involved than Rowe in conducting and supporting research. Together, they more nearly match the combined conservation portfolio of the Cheetah Conservation Fund in terms of land management, research, education, and outreach than either would singly; their combined operating budgets total roughly US\$1.84 million, comparable to the Cheetah Conservation Fund’s revenues of US\$1.37 million.

The Rowe Bird Sanctuary, near Gibbon, NE, is owned and managed by the National Audubon Society, and it includes 4 kilometers of river channel, wet meadows, and some 700 hectares of agricultural fields. Along with preserving habitat for wildlife and hosting crane watchers, Rowe conducts year-round nature-based education for local schools and the general public. From early March until early April, Rowe becomes a major site for tens of thousands of tourists who come to see the cranes.

The Platte River Whooping Crane Maintenance Trust is located in Wood River, NE, about 43 kilometers from Rowe Sanctuary. It was established as a result of a \$7.5



Plate 6. Sandhill Cranes (*Grus canadensis*) in Bosque Del Apache National Wildlife Refuge, New Mexico. Photo by Richard Reading.

million settlement in a 1978 lawsuit and given the mission of protecting and maintaining the physical, hydrological, and biological integrity of the 130-kilometer Big Bend reach of the Platte River. It manages trust lands (currently over 4,050 hectares) and conducts research to understand and conserve crane and other migratory bird habitats. It also conducts educational and implementation programs.

### Revenue and Expenditures of Centers

At each site we collected information about the centers' direct revenues and expenditures. At the Cheetah Conservation Fund, we used the audited financial statement from 2007 because the statement from 2008 was not available when we conducted the surveys. Both Rowe Sanctuary and the Whooping Crane Trust were able to provide budget information for the 2008-9 fiscal year. Financial records were helpful in determining the direct effect from foreign (Cheetah Fund) or out-of-region (Rowe/Whooping Crane) donations, because we could trace the origin of donations. Revenue totals for Namibia are converted to U.S. dollars using an exchange rate of N\$7.5 equals US\$1 (see Appendix 1).

### Spending of Visitors and Volunteers

Offsite spending by visitors and volunteers to both the Cheetah Conservation Fund and Rowe Sanctuary is another important component of the direct economic impact of these research and education centers (The Whooping Crane Trust has few visitors, and we did not measure their impact). Offsite spending occurs at businesses such as lodging establishments, restaurants, retail stores, gasoline stations, or even other types of entertainment. Neither center has records of offsite spending, and offsite businesses do not specifically track what sales came from visitors to the Conservation Fund or to the Sanctuary.

To obtain information on offsite spending, we surveyed visitors and volunteers. (The survey forms are in Appendix 2.) We gathered data from visitors by distributing an intercept survey to them as they arrived at the visitors' centers at the Cheetah Conservation Fund and Rowe Sanctuary. A member of each household was handed a paper survey form and asked to complete it on his or her own and (to ensure anonymity) to place it in a collection box. Visitors had only one opportunity to complete the survey.

Distribution of the visitor surveys varied slightly between the Cheetah Conservation Fund and Rowe Sanc-

tuary. The former has a long visitor season, so its staff distributed the survey during both winter (July-August) and summer (November-December) of 2008. One coauthor planned onsite logistics of the survey and trained Cheetah Fund staff during a visit to Namibia in June 2008. Rowe has a shorter visitor season, with nearly all annual visitors coming during the peak migration season between roughly March 1 and April 15, so at Rowe the coauthors and their graduate assistants distributed surveys to all arriving visitors beginning at noon on four days (two Saturdays, a Sunday, and a Friday) during the peak period in 2009. Surveys asked respondents about their country of origin, their reasons for visiting the Fund/Rowe and Namibia/central Nebraska, the length of their trip, and their spending patterns.

For volunteers, we obtained complete records of contact information, including e-mail addresses. At the Cheetah Conservation Fund we conducted our survey after volunteers had completed their service, so we sent the survey form to all 2008 volunteers via e-mail, and we sent only one round of e-mails. At Rowe Sanctuary, we conducted our survey of volunteers during the peak volunteer season; volunteers were given a paper survey form by Sanctuary management on their last day of service or were later sent the survey via e-mail.

Each questionnaire contained 14 standardized questions asking where respondents lived, the amount of their spending, the size of their party, the length of their trip, and either (1) the importance of either Cheetah Conservation Fund or Rowe Sanctuary to their decision to make the trip (for external visitors) or (2) what they would have done otherwise (for local visitors). All surveys were in English, and respondents in Namibia were given an opportunity to report their spending in any currency. The survey forms took three to five minutes to complete. At the request of Cheetah Conservation Fund management, we included two additional questions for the Namibian surveys: for visitors, how much value did their visit to the Fund contribute to their overall Namibia trip? and for volunteers, how likely were they to provide the Fund with donations or other help after their visit?

### Survey Response Rates

Surveyors at the Cheetah Conservation Fund did not specifically track the number of refusals, so we do not have a direct estimate of the response rate. However, Fund records indicate that during the four months of July, August, November, and December when surveying occurred, there were 2,233 visitors to the Fund. Surveying



was ongoing during all three months. We received 117 completed responses representing 346 visitors, which reflect 16% of all visitors during survey months. We were not able to directly monitor the survey procedure, so we are uncertain of the extent to which the remaining 84% represents nonrespondents versus visitors who were not asked to complete the survey.

At Rowe Sanctuary, the response rate for the visitor survey was 86%. We approached a total of 411 visitors, and 353 completed the survey while 58 declined. We anticipate that the high response rate would minimize concerns regarding nonresponse bias.

The response rate for the volunteer survey at Cheetah Conservation Fund was 19%. We received 15 completed surveys, while 65 volunteers did not respond. To assess nonresponse bias, we have one measurable characteristic with which to compare respondents and nonrespondents: country of origin. This could be an important determinant of spending. We found little difference between respondents and nonrespondents. We found that 67% of respondents were from North America versus 63% of nonrespondents, and 33% of respondents were from Europe versus 26% of nonrespondents. There were, however, no respondents from Australia even though 9% of nonrespondents were from Australia. Despite these similarities, nonresponse bias possibly due to unmeasured differences such as income or age between respondents and nonrespondents could influence spending patterns.

The response rate for the volunteer survey at Rowe Sanctuary was 43%. We distributed surveys to an estimated 53 volunteers and we received responses covering 23 volunteers; surveys covering the remaining 30 volunteers were not completed.

Overall, we believe that the survey data we collected provide us with accurate information about the spending patterns and purpose of trip of visitors to the Cheetah Conservation Fund and to Rowe Sanctuary. For further consideration of potential survey bias see Appendix 1. These data are used to calculate the impact from offsite spending at each research and education center.

### **Assessing Economic Impact**

The grants, donations, tuition payments, and other funds attracted to a grasslands region by research and education centers generate a regional economic impact. According to export-base theory (Brown et al. 1992), the new funds flowing into the regional economy both directly increase the size of the regional research and education industry and also generate additional activity in

locally oriented secondary industries within the regional economy. The sum of the direct and secondary impacts is known as the total economic impact.

We used economic multipliers to calculate the total economic impact resulting from the direct impact of each research center. Economic multipliers show the dollars of total impact for each dollar of direct impact. We estimated the multipliers for the Namibian economy using the coefficients of the 2004 Social Accounting Matrix (SAM) for Namibia developed by Lange (2008a, 2008b), which is the most recent SAM available for Namibia and representative of the Namibian economy in 2007. For central Nebraska, we used the IMPLAN (Impact Analysis for Planning) Pro modeling software developed by the Minnesota IMPLAN Group (2006). This software is widely utilized for economic impact analysis by federal government agencies, state and local governments, universities, and private businesses. IMPLAN modifies the U.S. Input-Output Accounts for local economies based on detailed economic data for counties, or combinations of counties, to produce a local Social Accounting Matrix. We utilized the IMPLAN Pro software to develop a Social Accounting Matrix for the 12-county central Nebraska region, and then used the matrix to calculate economic multipliers. For further consideration of our choice of multipliers see Appendix 1.

We also used the Lange (2008a, 2008b) (Namibia) and Minnesota IMPLAN Pro (2006) (central Nebraska) models to estimate the employment impact on the regional economies. Jobs are reported in full-year equivalents to adjust for the seasonal nature of some of the employment opportunities related to offsite spending by visitors and volunteers.

Throughout the analysis, we consider the economic impact of the Cheetah Conservation Fund on the national economy of Namibia and the impact of Rowe Sanctuary/Whooping Crane Trust on the regional economy of central Nebraska, a 12-county area bounded by the three cities of Kearney, Grand Island, and Hastings. This comparison is appropriate for several reasons. First, the aggregate sizes of the two economies are similar. Namibia has a reported gross domestic product of about US\$11 billion, and we calculate that central Nebraska has a gross domestic product of roughly \$7 billion (Appendix 1). Second, we believe that it makes sense to take a national perspective in a less populated country such as Namibia. And finally, as we will see, the vast majority of resources that support the Cheetah Conservation Fund come from international sources; that is, they come from outside Namibia and create an impact on the country. By contrast,

TABLE 1  
ORIGIN OF VISITORS TO THE CHEETAH CONSERVATION FUND AND ROWE BIRD SANCTUARY

	Cheetah Conservation Fund		Rowe Sanctuary	
	Visitors (%)	Volunteers (%)	Visitors (%)	Volunteers (%)
<b>Number of completed surveys</b>	117	15	353	16
<b>Response rates</b>	16	19	86	43
<b>Countries of origin (Cheetah Conservation Fund)</b>				
Germany	33	7		
United Kingdom	13	27		
Switzerland	11	0		
France	8	0		
Other European	17	0		
United States or Canada	9	67		
Namibia	3	0		
Other African nation	2	0		
Other	3	0		
<b>States of origin (Rowe Sanctuary)</b>				
Nebraska			52	43
Iowa			14	4
Colorado			8	0
Kansas			4	0
Missouri			3	4
Other states			18	48
Other countries			1	0

in the case of Rowe Sanctuary/Whooping Crane Trust, most of the resources that support these centers flow from outside central Nebraska, but a significant portion of visitor spending and support comes from within the state of Nebraska, suggesting that the central Nebraska region is the appropriate focus for economic impact analysis.

## RESULTS

### Survey Results

Most of the visitors and volunteers to the Cheetah Conservation Fund were international in origin, with Europeans making up the majority (Table 1). The majority of the volunteers for the Cheetah Conservation Fund

were from the United States. Only 3% of visitors to the Cheetah Conservation Fund came from Namibia, and another 2% came from other African countries. Visitors to Rowe Sanctuary generally traveled shorter distances, with 52% of the visitors coming from Nebraska (Table 1). Many visitors traveled from the nearby cities of Lincoln and Omaha, and 29% of visitors came from the neighboring states of Iowa, Colorado, Kansas, and Missouri. The remaining visitors came from Minnesota, the Dakotas, or more distant states, and 1% were international visitors. At Rowe, 43% of the volunteers came from Nebraska, 8% from Iowa, Colorado, Kansas, and Missouri, and 48% from other states.

For 15% of visitors to the Cheetah Conservation Fund, visiting it was one of the top three or four reasons

TABLE 2  
CHARACTERISTICS OF VISITS TO THE CHEETAH CONSERVATION FUND  
AND ROWE BIRD SANCTUARY

	Cheetah Conservation Fund		Rowe Sanctuary	
	Visitors (%)	Volunteers (%)	Visitors (%)	Volunteers (%)
<b>Importance of Cheetah Conservation Fund/Rowe Sanctuary in decision to come to Namibia/central Nebraska</b>				
It was the principal reason I came.	0.0	100.0	57.9	100.0
It was one of three or four reasons that I came.	15.3	0.0	21.2	0.0
It was mentioned in the tour information and looked interesting.	44.1	0.0	10.4	0.0
It was not very important, because I would have come to the area anyway.	37.8	0.0	10.4	0.0
Other response	2.7	0.0	0.0	0.0
<b>Extra days spent in Namibia/central Nebraska due to attraction</b>				
0 days (visiting the attraction has no effect on the length of trip)	73.6	NA	92.7	NA
1 day	23.6	NA	7.3	NA
2 days	1.8	NA	0.0	NA
More than 2 days	0.0	NA	0.0	NA
Other response	0.9	NA	0.0	NA
<b>Length of visit to Namibia/central Nebraska (days)</b>	15	28	2	12

NA = not applicable.

for traveling to Namibia; these visitors on average spent 15 days in Namibia (Table 2). A visit to Rowe Sanctuary was the principal reason that 58% of visitors we surveyed came to central Nebraska, and for another 21% it was one of three or four primary reasons for coming to the area (Table 2). The average length of trip for visitors to Rowe Sanctuary was two days.

### Economic Impact Results

The operating budgets of the Cheetah Conservation Fund and Rowe Sanctuary/Whooping Crane Trust are similar in overall size (Table 3). Both also derive a majority of their revenue from sources linked to research and education, such as volunteer fees and tuition, donations, trusts, and grants. Such sources account for more than 85% of the Cheetah Conservation Fund's revenue and more than 75% of revenue for Rowe Sanctuary/Whooping Crane Trust (Table 3). Grants alone accounted for

between 31% and 43% of revenue. Looking at specific sources, the Cheetah Conservation Fund received a substantially larger percentage of revenue from donations, while Rowe Sanctuary/Whooping Crane Trust relied more on transfers from its trusts. But the primary difference is that while both the Cheetah Conservation Fund and Rowe Sanctuary/Whooping Crane Trust benefit from a significant number of volunteers, Cheetah Conservation Fund volunteers also pay tuition, so that tuition accounted for more than 10% of its revenue.

Among earned revenue, Rowe Sanctuary/Whooping Crane Trust earned a much larger percentage of revenue from the rental of land (Table 3). In both cases, the earned revenue from tourists, such as through arranged tours as well as merchandise sales at gift shops, represented a modest source of revenue for the centers. However, these activities may improve the quality of the visitor experience and contribute to visitors becoming future donors.

TABLE 3  
REVENUE SOURCES OF RESEARCH AND EDUCATION CENTERS

Category	Cheetah Conservation Fund		Combined Rowe Sanctuary/ Whooping Crane Trust		Rowe Sanctuary	Whooping Crane Trust
	Spending (millions of US\$)	Percentage of spending (%)	Spending (millions of US\$)	Percentage of spending (%)	Spending (millions of US\$)	Spending (millions of US\$)
Volunteer fees/tuition	0.14	10.5	0.004	0.2	0.004	0.00
Transfer from trust	0.00	0.0	0.71	38.6	0.08	0.63
Donations	0.44	32.3	0.11	6.0	0.11	0.00
Grants	0.59	43.5	0.57	31.0	0.22	0.35
Land rental	0.00	0.2	0.35	19.0	0.00	0.35
Store merchandise	0.07	5.2	0.08	4.3	0.08	0.00
Tourist activities	0.08	6.1	0.10	5.4	0.10	0.00
Other	0.03	2.2	0.00	0.0	0.00	0.00
Total revenue	1.37	100.0	1.84	100.0	0.59	1.25

Sources: Cheetah Conservation Fund Audited Financial Statements, December 2007; 2009 Budget Projections of the Rowe Sanctuary; and Platte River Whooping Crane Maintenance Trust, Inc.

TABLE 4  
ECONOMIC IMPACT FROM OPERATIONS OF RESEARCH AND EDUCATION CENTERS

	Cheetah Conservation Fund	Rowe Sanctuary/ Whooping Crane Trust
Revenue (millions of US\$)	1.37	1.84
Percentage supported by external donations and grants	95.6	83.2
Percentage supporting expenditures in 2007	95.1	100.00
Direct effect (millions of US\$)	1.24	1.53
Multiplier	2.37	1.71
Total economic impact (millions of US\$)	2.94	2.62

The revenues of the Cheetah Conservation Fund and Rowe Sanctuary/Whooping Crane Trust determine the economic impact from the operations of the centers (Table 4). The Cheetah Conservation Fund annual financial statement for 2007 indicates that 95.6% of its income came from foreign grants and donations or from tourist spending. For example, grants or volunteer fees from Cheetah Conservation Fund–USA provided roughly one-quarter of all income, according to the financial statement. Some income came from domestic sources, however, such as educational programs delivered to

Namibian farmers, grazing services, payments from insurers, or sales of used equipment. A portion of gift shop sales and other onsite income, such as donations and gifts by visiting tourists, is also from domestic rather than foreign visitors. To estimate sales, donations, and gifts by visiting tourists, we assume 89% are from foreign visitors, based on Cheetah Conservation Fund data on the share of visitors from outside Namibia. We use the 95.6% figure for foreign sourcing to estimate, conservatively, that \$1.31 million of the \$1.37 million in 2007 Cheetah Conservation Fund–Namibia revenue came from foreign

sources. Further, not all of the 2007 revenue was actually spent during that year: total 2007 expenditures including Cheetah Conservation Fund farms were 95.1% of its 2007 income. In other words, only 95.1% of the revenue raised in 2007 was spent during that year. Applying these percentages in Table 4 yields an estimated direct effect of \$1.24 million in 2007.

For Rowe Sanctuary/Whooping Crane Trust, budget information for fiscal year 2009 (July 2008 through June 2009) indicates that 83% of revenue came from outside the central Nebraska region (Table 4). The origin of revenue varied by revenue type. All trust and grant revenue came from outside the central Nebraska region. Revenue from land rental, on the other hand, was paid by local sources, primarily local agricultural producers. Store sales, donations, and other tourism revenue received by Rowe Sanctuary was generated by visitors, and survey results indicate that nearly 87% of visitors to Rowe come from outside the central Nebraska region. According to the budget information, 100% of revenue will be expended during fiscal year 2009. Applying these percentages in Table 4 yields an estimated direct impact from Rowe Sanctuary/Whooping Crane Trust of \$1.53 million in fiscal year 2009.

Using economic multipliers, we found that the Cheetah Conservation Fund's operations, including their secondary impact, had a total annual economic impact of \$2.94 million, whereas those of Rowe Sanctuary/Whooping Crane Trust had a total annual impact of \$2.62 million (Table 4). Thus, capturing the secondary impacts through the use of economic multipliers greatly increases the estimate of total economic impact of the centers.

We used the survey results reported in Tables 1 and 2 to estimate the direct and total impact from the offsite spending of visitors and volunteers (Table 5). Recall that for 15% of visitors to the Cheetah Conservation Fund, visiting it was one of the top three or four reasons for traveling to Namibia; further, these visitors on average spent 15 days in Namibia. We assign one-quarter of those days in Namibia to the Cheetah Conservation Fund, for an increase of 3.75 days in Namibia due to the Cheetah Conservation Fund among these 15% of visitors. This increase translates into 0.57 days in Namibia per Cheetah Conservation Fund visitor, yielding \$0.23 million from additional spending in the country. This new spending is the direct impact, and grows to \$0.65 million once the secondary impact is included. Further, given that nearly 25% of visitors to Namibia extended their trip in order to visit the Cheetah Conservation Fund, we can calculate that there is another \$0.11 million in direct impact and \$0.30 million in total economic impact due to additional days in the country.

Most of the increase in direct and total economic impact from offsite spending by visitors to Rowe Sanctuary came from visitors who made a special trip to central Nebraska (Table 5). Recall from Table 2 that the average trip length for visitors to Rowe Sanctuary was two days and that visiting Rowe was the principal reason for 58% of visitors who came to central Nebraska and one of three or four primary reasons for another 21% of visitors; we use these data to calculate that the average visitor from outside the region spent 1.27 days in central Nebraska because of Rowe. On the other hand, few visitors extended the length of their stay in central Nebraska due to Rowe. The average visitor only added 0.014 days to the length of their trip. Given average daily spending of \$52 per visitor, we estimate that visitors to Rowe Sanctuary spent \$0.72 million offsite in central Nebraska because of a special trip to Rowe and only \$0.01 million due to extending the length of their trip. We included in our estimates of average daily spending only the estimated markup portion of gasoline and other retail sales. Gasoline and other retail items are largely produced outside the region, but the markup supports regional businesses and employees.

For volunteers at the Cheetah Conservation Fund, we use spending during their entire trips to Namibia to calculate a direct impact of \$0.09 million and a total economic impact of \$0.24 million (Table 5). Volunteer spending accounted for fully 20% of the total offsite spending impact by Cheetah Conservation Fund volunteers or visitors. In Namibia, volunteers account for a significant share of the economic activity, whereas at Rowe Sanctuary, the estimated offsite spending was only \$0.02 million.

Table 5 also shows the total impact of additional visitor trips, extended visitor stays, and volunteer spending after including the secondary impact. The magnitudes of the total economic impacts from offsite spending are again similar between sites, equaling \$1.19 million for visitors and volunteers in Namibia and \$1.18 million (with rounding) in central Nebraska.

Collecting these various impacts, the Cheetah Conservation Fund's overall total economic impact from operations and offsite spending was \$4.13 million in 2007, and the total economic impact of Rowe Sanctuary/Whooping Crane Trust was \$3.80 million in fiscal year 2009 (Table 6). The Cheetah Conservation Fund's total employment impact was 177 full-year-equivalent jobs, and the total employment impact of Rowe Sanctuary/Whooping Crane Trust was 63 full-year-equivalent jobs (Table 6). The Cheetah Conservation Fund created a greater number of employment opportunities in Namibia than did Rowe Sanctuary/Whooping Crane Trust in central Nebraska.

TABLE 5  
ECONOMIC IMPACT OF OFF-SITE SPENDING BY VISITORS AND VOLUNTEERS

	Cheetah Conservation Fund	Rowe Sanctuary/ Whooping Crane Trust
<b>Visitors' additional trips to region</b>		
Number of visitors from outside region	4,439	10,850
Average increase in days spent in region	0.57	1.27
Average spending per person per day (US\$)	91	52
Direct effect (millions of US\$)	0.23	0.72
Multiplier	2.78	1.59
Added economic impact (millions of US\$)	0.65	1.14
<b>Visitors' increase in length of stay in region</b>		
Number of visitors from outside region	4,439	10,850
Average increase in days spent in region	0.27	0.014
Average spending per person per day (US\$)	91	52
Direct effect (millions of US\$)	0.11	0.01
Multiplier	2.78	1.59
Total visitors' economic impact (millions of US\$)	0.95	1.16
<b>Number of volunteers from outside region</b>		
Average spending per person per trip (US\$)	758	291
Direct effect (millions of US\$)	0.09	0.02
Multiplier	2.78	1.59
<b>Total volunteer economic impact (millions of US\$)</b>	<b>0.24</b>	<b>0.02</b>
<b>Total visitor + volunteer economic impact (millions of US\$)</b>	<b>1.19</b>	<b>1.18</b>

TABLE 6  
SUMMARY OF ECONOMIC IMPACTS OF CHEETAH CONSERVATION FUND  
AND ROWE SANCTUARY/WHOOPING CRANE TRUST

	Cheetah Conservation Fund	Rowe Sanctuary/ Whooping Crane Trust
<b>Total economic impact (millions of US\$)</b>		
Research and education center operations	2.94	2.62
Visitors	0.95	1.16
Volunteers	0.24	0.02
<b>Overall economic impact (millions of US\$)</b>	<b>4.13</b>	<b>3.80</b>
<b>Employment impact (number of jobs)</b>	<b>177</b>	<b>63</b>

## DISCUSSION

Tourism revenue is well understood as a revenue stream that can flow in support of habitat preservation (Jones et al. 2005; Hodur et al. 2005, 2008). Game farms and wildlife-viewing reserves are increasingly recognized for their positive impact on the economy as well as protecting and restoring wildlife (Jones et al. 2005). Fortunately, a body of research literature on the economic value of such enterprises is now emerging, although quantitative studies remain sparse. Research and education centers also can have a substantial economic impact, but this impact remains little studied.

Hunting and fishing have a long history in the Great Plains, with other forms of nature-based tourism acquiring prominence more recently. Data reported by the U.S. Fish and Wildlife Service (2006) show that in 2006 nature tourists spent over \$450 million in Nebraska, Kansas, and South Dakota, and such revenues are important in other Great Plains states as well (for example, for North Dakota see Bangsund and Leistritz 2003). Hunting and fishing expenditures represented about 73% of the total; wildlife viewing represented the remaining 27%.

A chronic concern of those seeking to develop ecotourism enterprises is whether travelers will perceive the Great Plains as an attractive nature destination. Lacking such charismatic species as lions (*Panthera leo*), elephants (*Loxodonta africana*), or whales (*Orcinus* spp.), will the tourists come? Or to put the question differently, will the charismatic species of the Great Plains, such as bison, prairie dogs, elk (*Cervus elaphus*), and sandhill cranes, prove to be a sufficient draw?

The visitor origin data (Table 1) indicate that Rowe Sanctuary/Whooping Crane Trust has a much larger local visitor base than does the Cheetah Conservation Fund. Visits to the Cheetah Conservation Fund appeared to be a component of a larger trip to Namibia. None of the visitors who came to the Cheetah Conservation Fund indicated that their visit to the center was their primary reason for traveling to Namibia. But more than 15% indicated that it was one of three or four reasons to make the trip, suggesting a marginal contribution to the decision to make the trip, and another 24% indicated that they extended their stay in Namibia because of their trip to the Cheetah Conservation Fund.

Volunteers at both institutions traveled long distances to work at the Cheetah Conservation Fund or Rowe Sanctuary. There were 121 volunteers who traveled to the Cheetah Conservation Fund in 2007, mostly from North America and Europe. There were 53 volunteers at Rowe

Sanctuary in February-April 2009. Some volunteers came from the surrounding community, but many traveled from other states, some from as far away as California, Washington, and New Mexico. Volunteers also had long stays, with Cheetah Conservation Fund volunteers averaging a 28-day stay and Rowe Sanctuary volunteers staying an average of 12 days.

Volunteers through their tuition payments helped make a substantial contribution to the revenue stream of the Cheetah Conservation Fund (Table 3). They also make a contribution to the tourism impact of the center (Table 5). The role of volunteers is one of the unique and promising features of research and education centers within nature-based tourism (Brightsmith et al. 2008).

The estimates of total economic impact of both the Cheetah Conservation Fund and Rowe Sanctuary/Whooping Crane Trust are affected by the size of the multipliers chosen. In Appendix 1 we assess the sensitivity of our impact estimates to different plausible multipliers.

### Economic Impact from Operations

The similarity of the economic impacts of operations between the Cheetah Conservation Fund and Rowe Sanctuary/Whooping Crane Trust (Table 4) is interesting, given the different levels of wealth and per capita income in the two economies. Both centers have a substantial impact on their regional economies in terms of total dollars of business activity generated, but differences in impact do emerge if other metrics are used, especially the centers' contribution to employment. This difference occurs because the employment impact reflects differences in the standards of living in Namibia and the United States.

### Economic Impact from Offsite Spending

Offsite spending (Table 5) is often heightened because research and education centers do not provide tourism spending opportunities onsite. Thus, the offsite tourist spending component represents a substantial spillover impact to the regional economy from the centers. Our estimated tourism impact is substantially lower than that given in the Fermata (1998) study, primarily because we focus only on visitors to Rowe and not to the larger 130-kilometer region examined by Fermata—that is, we included only a subset of the visitors examined by Fermata. But our estimates also are lower because we considered the reason for tourist visits. We found that a significant minority of visitors did not make a special trip to central Nebraska to visit Rowe Sanctuary; rather,

they were already in the region for other purposes. We appropriately did not assign the offsite spending by such tourists as an economic impact of Rowe Sanctuary. The IMPLAN model also generated a somewhat lower economic multiplier of 1.59 compared to the regional multiplier of 1.9 used in the Fermata study.

The magnitude of the multiplier on offsite spending is much lower in central Nebraska than in Namibia (Table 5). This reflects two factors. First, tourism employment is a relatively higher-wage occupation in Namibia than in the United States, providing a bigger boost to the relative spending power of Namibian workers than it does for American workers. Second, many retail items sold to tourists in Namibia tend to be locally made, so the retail dollars spent there tend to stay there. In contrast, more of the retail goods sold in central Nebraska originate from outside the region, so more of the retail dollars spent there flow outside the region.

Visitor spending per day in both Namibia (\$91) and especially central Nebraska (\$52) was quite modest. Given much higher daily spending reported in other areas of high ecotourism attraction, the relatively low levels found in our survey may suggest that there is an unmet market opportunity for developing higher-value and higher-revenue tourism, including appropriate infrastructure and services.

## CONCLUSION

The two centers, Cheetah Conservation Fund and Rowe Sanctuary/Whooping Crane Trust, contributed significant economic benefits to their local or regional economies. Nearby residents should appreciate these centers as community economic assets as well as conservation sites. These economic impacts also suggest an additional argument that centers can use in seeking funds from donors, foundations, and government agencies. Conservation funders should value the fact that when they support the centers' conservation programs, they are also assisting the nearby human communities to thrive, and because of that benefit, such communities are much more likely to be supportive of conservation.

Nonetheless, the total size of their impacts appears modest relative to the overall economies in which they operate. Are conservation centers in fact just small players? There are two considerations that may suggest otherwise. First, such centers tend to be in environmentally threatened areas where the conservation tasks are located; such areas are typically remote and rural, and even small impacts may be of much importance. The

centers construct facilities, employ staff, purchase local services, and bring high-wage scientists and other experts who reside for long periods or even permanently in the region. As Larry Swanson (2007) has emphasized, in small economies, success in attracting even small numbers of people and jobs, especially if they are relatively high-wage jobs, may mark the difference between community success and decay.

Second, the overall impact of conservation centers depends on both the size of individual impacts *and* on how many of them there are. Good data on conservation organizations, even simply the number that exist, are lacking. However, for Africa there is at least a voluntary network or registry, the African Conservation Foundation ([www.africanconservation.org](http://www.africanconservation.org)), which lists 352 separate, active conservation organizations. This is clearly a partial listing (for example, African Conservation Foundation lists nine organizations in Namibia, yet the NamibRand Nature Reserve, discussed elsewhere in this issue, is not included). Still, the Cheetah Conservation Fund's impact of \$4.13 million per year, if multiplied by 352, would imply an annual economic impact of about \$1.5 billion. And certainly the actual number of conservation centers in Africa is much greater than 352. Further, the number of conservation centers appears to be growing—many of the current conservation centers were founded in the last two decades, according to our analysis. We selected a random sample of 100 conservation centers on the African Conservation Foundation list and checked the organizations' Web sites to determine when each organization was founded. During the 1990s, 38 organizations were founded, and during the first eight years of the current decade, 31 were founded.

Conservation centers may have a larger impact than would otherwise be expected. Donors and grantors presumably give money to conservation research and education centers because they believe that the research and education thereby produced is worth their gifts and grants. Our study simply shows that there is a coincident benefit, of perhaps surprising size, in the positive economic impact that such centers also have on the local economies. Donors and grantors may thus have an additional reason to support such centers.

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## APPENDIX 1

### 1. THE SIZE OF NAMIBIA'S AND CENTRAL NEBRASKA'S GDP

We compare the size of the economies of Namibia and central Nebraska as follows: For Namibia, we rely on the officially reported gross domestic product (see U.S. Central Intelligence Agency 2009). We convert Namibian dollars to U.S. dollars at the exchange rate of N\$7.5 = US\$1, which is roughly the rate that prevailed in 2007 during our study. For central Nebraska, we estimate gross domestic product for the 12-county region. An estimate is necessary because the U.S. Department of Commerce does not provide data on gross domestic product by county. We use a two-step process. In the first step, we utilize gross domestic product data by state for Nebraska in 2007 (the most recent year for which the data are available from the U.S. Department of Commerce). These data are available for each Nebraska industry. Then for each industry we calculate the ratio of gross domestic product per dollar of wages in that industry in Nebraska (2007 wage data is available from the U.S. Department of Labor). In the second step, we calculate the total wages in each industry in the 12-county region. We then multiply the wages in each industry in the 12-county region by the statewide ratio of gross domestic product per dollar of wages. This multiplication yields an estimate of the gross domestic product in each industry in the 12-county region. We then sum these estimates for all industries to obtain an estimate of total gross domestic product for the 12-county region. Our finding is that Namibia has a gross domestic product of about \$11 billion while central Nebraska has a gross domestic product of roughly \$7 billion.

### 2. ALTERNATIVE ECONOMIC MULTIPLIERS

Economic impact results are sensitive to the magnitude of economic multipliers, and the assumptions that

underlie those economic multipliers. One of the key assumptions in any multiplier estimate is the share of the supplies purchased by an impacted business (such as a research and conservation center) which is purchased within the region versus purchased externally: (A) Regions in which a larger share is purchased within the region have higher multipliers. (B) Different models for estimating economic multipliers have different estimates of the share purchased within the region. (C) Larger, more diversified economies also tend to have larger multipliers. There are more types of businesses in these larger economies, and as a result, a greater chance that supplies can be provided regionally. Therefore, when using a single multiplier model such as IMPLAN, large economies have higher multipliers. For example, economic multipliers for the state of Nebraska would be larger than the multipliers for the 12-county central Nebraska region. As a result of these three elements, economic multipliers for a given region may vary between IMPLAN, the multiplier model utilized in this article, and other multiplier models.

In Table A1, we show how much estimated economic multipliers can vary between alternative multiplier models, and between regions of different size. We focus on the case of the economic multipliers for Rowe Sanctuary/Whooping Crane Trust in central Nebraska. We use the Nebraska case, because alternative economic multipliers are not available for Namibia. For the first case, we compare the central Nebraska IMPLAN multipliers used in this paper to statewide IMPLAN multipliers. In the second case, we compare the central Nebraska multipliers with the multiplier for the Middle Platte region (from North Platte, NE, to Columbus, NE) developed by Jenkins and Konecny (1997), two faculty members at the University of Nebraska–Kearney, using an input-output model they developed for the region. These multipliers were used as local multipliers by Fermata Inc. (1998) in their study. The researchers reported a multiplier of

TABLE A1  
ALTERNATIVE ECONOMIC MULTIPLIERS FOR ROWE SANCTUARY/WHOOPING CRANE TRUST

	12-county IM-PLAN multiplier	Nebraska IM-PLAN multiplier	Jenkins and Konecny (1997) multiplier
Visitor spending multiplier	1.59	1.77	1.90
Research and education center multiplier	1.71	1.94	NA

NA = not applicable.

1.9 for tourist spending. No multiplier is available for research and education centers.

In Table A1, we see that the multipliers vary moderately. Using the IMPLAN model, the research and education center multiplier is 13% greater for Nebraska than for the 12-county central Nebraska region (1.94 vs. 1.71). Further, the visitor spending multiplier effect is 11% larger for Nebraska than for the central Nebraska region (1.77 vs. 1.59). The multiplier developed by Jenkins and Konecny for tourism spending is 19% larger than the IMPLAN multiplier (1.90 vs. 1.59).

These results show that different multiplier models and geographies yield moderately different estimates of the multiplier effect. The IMPLAN multipliers that we calculated are reasonable, and are less than the alternatives we examine in Table A1. More generally, research on available economic multiplier models has found that multipliers and impact estimates from the IMPLAN model are comparable to those from other multiplier models. Some comparisons during the 1990s did conclude that IMPLAN tended to estimate higher economic multipliers in service industries than alternative packages such as REMI, produced by Regional Economic Models, Inc., and Regional Input-Output Modeling System (RIMS II), produced by the U.S. Department of Commerce (Rickman and Schwer 1995). However, other comparisons found that results from the IMPLAN model were more plausible than those from the REMI model (Crihfield and Campbell 1991). Further, a recent comparison of models in tourism research found that IMPLAN and the alternative package REMI produced similar estimates of economic impact, as measured by output (Bonn and Harrington 2008). The study compared impact estimates across four Florida tourism events, and found that IMPLAN estimates of economic impact were alternatively less than or greater than those of REMI, with IMPLAN estimates ranging from 23% less than REMI estimates to 13% greater than REMI estimates. This last study also indicates that IMPLAN is commonly utilized in tourism

research, as do several other recent papers (Brown et al. 2002; Watson et al. 2008).

### 3. POTENTIAL FOR BIAS IN THE USE OF INTERCEPT SURVEYS

We utilized in-person intercept surveys in this research to gather information from research and conservation center visitors during their trip to the centers in Namibia and Nebraska. In the text of the article, we discussed our reasons for using an intercept survey and relevant survey results, such as response rates. Here we discuss some of the potential biases of utilizing in-person intercept surveys. While all types of survey techniques have potential for bias, we believe it is important to discuss the biases associated with intercept surveys in order to provide the reader with additional background information with which to interpret our survey results.

At least two types of bias can arise from intercept surveys. First, the fact that surveys are handed out in person may sway respondents to embellish their spending in order to please or help the person handing out the survey. This can also be a concern with telephone surveys, or any survey where respondents have contact with the surveyor. This type of bias is less of a concern for mail surveys. To address this issue, we designed our intercept survey process to create some of the arms-length characteristics of a mail survey. Our surveyors simply handed respondents a clipboard with the survey form and a pencil and let the respondents complete the survey on their own. In other words, our surveyors did not go through the questions with respondents. When the respondent completed the survey, the surveys were directly deposited by the person surveyed in a box to ensure the anonymity of all responses.

A second type of bias can result because respondents are filling out the survey on the day they attended the conservation and recreation center. The enthusiasm created by their visit also could create an incentive to embellish

TABLE A2  
ECONOMIC IMPACT AT ROWE SANCTUARY/WHOOPING CRANE TRUST  
UNDER ALTERNATIVE MULTIPLIERS

	12-county IMPLAN multiplier	State IMPLAN multiplier	Jenkins and Konecny (1997) multiplier
<b>Visitor spending</b>			
Direct effect (millions of US\$)	0.75	0.75	0.75
Multiplier	1.59	1.77	1.90
Total economic impact (millions of US\$)	1.18	1.33	1.43
<b>Research and education center operations</b>			
Direct effect (millions of US\$)	1.53	1.53	1.53
Multiplier	1.71	1.94	NA
Total economic impact (millions of US\$)	2.62	2.97	NA

NA = not applicable.

their responses, to aid the conservation and recreation center. This is a potential concern. However, we note that this bias could be less problematic than adopting an approach where we contact visitors at a later date (perhaps by gathering contact information on the day visitors came to the research or conservation center). There would be substantially lower response rates if we contacted visitors at a later date, most likely leading to significant response bias, where only the more enthusiastic visitors would take the time to discuss their spending during their earlier visit. This could place an even greater upward bias on our spending estimates.

#### 4. SENSITIVITY OF RESULTS TO ECONOMIC MULTIPLIERS

In section 2 above we examined alternative economic multipliers that might be used to estimate the economic impact of Rowe Sanctuary/Whooping Crane Trust. In Table A2 we show how sensitive our total economic impact estimates are to the choice of multiplier, using the case of the Rowe Sanctuary/Whooping Crane Trust in the central Nebraska region. Following the discussion above, in the

first case, we compare the central Nebraska IMPLAN multipliers used in the article to statewide Nebraska IMPLAN multipliers. In the second case, we compare the central Nebraska multipliers with the multiplier for the Middle Platte region (from North Platte, NE, to Columbus, NE) developed by Jenkins and Konecny (1997) and used as local multipliers by Fermata Inc. (1998) in their study.

As before, we see that results are sensitive to the choice of multiplier, but that our estimates are conservative compared to other multipliers in use. Further, the absolute magnitude of the differences is modest. Even using the Jenkins and Konecny (1997) multiplier, our estimated annual economic impact of visitor spending at Rowe Sanctuary/Whooping Crane Trust would have only been \$250,000 larger. Further, if we had used a larger statewide IMPLAN multiplier, our estimated annual economic impact from research and education center operations would have been just \$350,000 larger. These estimated impacts are larger, but such modestly larger impacts would have served only to reinforce the principal conclusion of our report—that research and education centers make a significant contribution to their economies.

## APPENDIX 2

Online at <http://www.unl.edu/plains/publications/GPR/gprdatarep.shtml>