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Platte River Birding and the Spring Migration: Humans, Value, and Unique Ecological Resources

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Each spring Sandhill Cranes migrate north through the Platte River region to nesting grounds. Wildlife watchers were surveyed to understand the extent to which they valued the ecological resources that provided birding opportunities. A mail questionnaire containing scenarios (with a cost attached to each) focused on management programs to preserve the present status of the river, proposed changes in species diversity, and on Sandhill Crane population levels. Birders were willing to bear the cost of resource conservation, particularly those expenses related to efforts to protect Sandhill Cranes and their habitats. Also, crane population declines were viewed as a diminishment in value, and thus lower numbers of cranes would lead to decreased recreational activity. Birders were less supportive of programs to conserve or enhance wildlife diversity. Birders were likely attracted by the wildlife spectacle rather than unusual or unique species. Overall, they valued species diversity less than species abundance.

Keywords contingent valuation, stated preference, willingness-to-pay, birding, eco-tourism, economic value

Each spring, more than 500,000 Sandhill Cranes migrate through the Platte River valley in Nebraska to nesting grounds in Canada, Alaska, and Siberia. The annual gathering of mostly Sandhill Cranes and an occasional Whooping Crane along the Platte has been referred to as America's equivalent of the Serengeti, a wildlife spectacle that attracts visitors to Nebraska from far and wide (Personal communication, B. Irvin, World Wildlife Fund, April 25, 2002). It has been rated one of the ten best places to bird in the United States (Pasquier, 1997).

About 80% of all Sandhill Cranes come to the Platte each spring for food and rest. The Sandhills begin to arrive in mid-February and spend 4 to 6 weeks in residence increasing their weight by feeding on waste corn in the fields and meadows. When dusk approaches, they roost where shallow water covers the sandbars in the middle of the

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channel. They do this for protection from predators. During the height of the migration, 50,000 to 100,000 cranes occupy the most heavily used reaches of the river with concentrations as high as 10,000 birds per one-half mile of river. At dawn, they return to nearby fields (Platte River Whooping Crane Maintenance Trust, 2003).

Currently, a series of 15 dams along the Platte have reduced flows and allowed woody vegetation to flourish along the banks and sandbars of the river. Consequently, nesting habitat for Sandhill and Whooping Cranes on the Platte has been reduced substantially. Along certain stretches, the river is now only 10 to 20% of its original width and the river is continuing to narrow (Currier, 1997).

With the availability of inexpensive water from the Platte River, most of Nebraska's land is now used for production agriculture. Tourism ranks third as an earner of out-of-state revenue (Nebraska Department of Economic Development, Division of Travel and Tourism, 1996) and the Platte River and its wildlife resources constitute an important component of the state's overall tourism industry. This article focuses on the birders who experience the crane migration along the Middle Platte River and the value they place on the biological resources that support the birding opportunities found there. Birders and associated business value the Platte River for its wildlife and related ecosystems whereas others value the river for its water for power generation purposes or in support of agriculture.

There are many dilemmas here for human dimensions researchers. Should resource uses that are the easiest to quantify and apparently the most important dominate every development decision or are there other values perhaps just as important that should be taken into account? With greater knowledge, would different public sector development decisions be made? Besides resource values that are reflected in markets, there are others that are not so easily recognized such as contributions to the gene pool and other arguments made by ecologists. Also, there is the matter of monetary values as exhibited by markets or measured with nonmarket techniques and the recognition that they may not capture everything one would like but at least they put the resource into the currency used in benefit/cost policy debates (Haab & McConnell, 2002).

Sandhill Cranes fall under the jurisdiction of the Migratory Bird Treaty Act (16 U.S.C. 715) and may be hunted. Whooping Cranes are protected under the Endangered Species Act (ESA) (16 U.S.C. 1531 et seq), which seeks "to conserve to the extent practicable the various species of fish or wildlife and plants facing extinction" (16 U.S.C. 1531). There were 238 Whooping Cranes in 2 flocks in the U.S in 2000, the most since the U.S. government started censusing in the 1930s. Today, there are 338 Whooping Cranes in the world (with roughly 100 in captivity http://whoopers.usgs.gov/geninfo.htm) . Although endangered species preservation is mandated, such policy choices have costs. Where there are costs, those in the policy arena ask "To what ends are they borne?" If programs are modified, to what extent will they deliver a better return? It is these issues to which we now turn.

Nonmarket valuation approaches are useful for approximating market-equivalent metrics for goods and services like birds (and birding experiences) not customarily traded in the marketplace. Such valuations are performed so that more reasonable comparisons can be made in the policy evaluation process. Accordingly, decision-makers should consider both the "pros" and "cons" that will result from their decisions relative to some "initial" or baseline situation and value. Some potential gains could come at the expense of important environmental losses downstream. For example, for evaluation purposes, some common metric would need to be assigned to all potential impacts, usually a monetary measure.

Methods for valuing goods and services may be categorized as based on markets, market-inferences, and contingent behavior. Market valuation uses existing markets and their resultant prices for assigning values to changes in the quantity or quality of an item of concern (Freeman, 2003). Market inference (or revealed preference) approaches utilize market decisions to infer values for items not exchanged in the marketplace such as air quality and recreational experiences (Ward & Bell, 2000; Freeman, 2003). Contingent behavior or stated preference (Freeman, 2003) approaches all use some form of contingent circumstances to elicit a response based on the contingency becoming reality. That is, "What would you do if . . ." and in this sense they are hypothetical in nature. Although this has been a source of criticism, well-designed studies have become accepted practice and their results used credibly in the policy-evaluation process (Mitchell & Carson, 1989). Often, this approach is the only one available.

The objective of the article is to use stated preference techniques to determine the values birders placed on a river resource, wildlife resources, and their birding experiences under various resource conditions. We sought to develop an approach using varied measures of diversity, abundance, and cost that would also be useful to decision-makers making allocation decisions.

Methods

As a part of a U.S. Environmental Protection Agency (USEPA) risk assessment for the Platte River (Eubanks, Ditton, & Stoll, 1998), wildlife watchers along the Middle Platte River (henceforth referred to as Platte River Study Area or PRSA) were surveyed to understand their personal characteristics, participation patterns, expenditures, and willingness-to-pay (consumer's surplus). The PRSA is a 19-county area in Nebraska stretching from Columbus in the East to North Platte in the West.

Seven populations of birders and general wildlife watchers comprised the sampling frame for this study. The study populations were roughly divided between events, locations, and organizations. Our goal was to sample the diversity of birders who experienced the crane migration in the study area. Populations included: (1) crane watchers at Fort Kearney State Historical Park and Recreational Area, (2) visitors reserving viewing blinds at the Lillian Annette Rowe Sanctuary, (3) visitors reserving blinds at the Crane Meadows Sanctuary, (4) Nebraska members of the National Audubon Society, (5) members of the Nebraska Ornithologists' Union, (6) registrants at the Spring River Conference, a three-day birding event held in Kearney, Nebraska, and (7) registrants at the Wings over the Platte Festival held in Grand Island, Nebraska.

We surveyed a wider range of birdwatchers than previously in the literature, which has focused mainly on membership group and festival birders (see, e.g., McFarlane, 1996; Scott, Baker, & Kim, 1996). Mailing lists were available for all birder groups except for those at Fort Kearney. Here, field surveyors used a random selection procedure to sample park visitors who watched cranes on-site on weekend days and weekdays between March 1 and April 15, 1996. Surveyors explained the purpose of the study, solicited birders' cooperation, and collected name and address information for a follow-up questionnaire mailing to participants. Once mailing lists were available, the survey methodology was the same for all groups.

The goal was to sample 300 persons per group; sometimes this was not possible and all names were used. After eliminating duplicates, 1,963 individuals were contacted. The mail survey approach followed the survey protocol advocated by Dillman (1978). All persons received identical surveys with the exception that bids offered in the contingent valuation model differed.

Using a 10-page self-administered questionnaire, we asked about their birding experience overall and in the study area, commitment to birding, organizational membership, and motivations for birding participation. They were also asked to describe their most recent trip to the Platte River study area and trip-related expenditures. Telephone surveys of non-respondents were conducted to test for differences between those who did and did not respond to the mail survey. This was done to account for nonresponse bias in the survey results (Fisher, 1996). The phone survey contained 11 questions from the mail survey, including questions about the respondent's general birding activity and most recent birding trip to the PRSA.

The contingent valuation method (CVM) was used to estimate the net economic value (willingness-to-pay) of birding-related goods and services. The value of the wildlife resources in the study area was reflected in the difference between the total benefits received (total economic value) and the expenditures incurred while using these resources. These net benefits received by individuals likely included existence valuation for the PRSA birding resources (i.e., various forms of altruism as related to habitat and species protection, use by others now or in the future, and intrinsic rights to exist regardless of use by or usefulness to humans). These values were captured in our study for users of the resource but not others who may place value on the existence of these resources.

Expectations

Several variables are useful for modeling contingent behavior. For any item, the higher its price, the less likely a consumer (*ceteris paribus*) is to purchase the item. Thus, for any proposed set of management outcomes, the higher the management cost, the less likely a respondent should find it acceptable. Economic theory suggests that the willingness to bear any given management cost should be directly related to a respondent's income. The characteristics of the good being purchased (management results) would also be expected to impact the decision to purchase the item. Thus, higher levels of species diversity and crane populations should be positively related to a respondent's willingness to bear any given management cost.

We expected that the more frequently an individual participates in an activity like birding, the more likely there is to be a positive response to bearing higher prices (or management costs). Also, we expected that more skilled birders are likely to express a stronger attachment to birding (more committed), and be less likely satisfied by a typical birding experience that may seem "extremely satisfying" to a less skilled birder. Further, we expected skilled birders to value the resources upon which their birding activities depend quite high relative to less skilled birders. The resources on which birding depends were expected to be valued positively by all types of birders, but more highly by those who were skilled and expressed a greater degree of commitment toward birding (Oh et al., 2005). Therefore, the use aspects of birding experiences in the Platte River region were likely less valued by highly skilled birders than by less skilled birders. The former group would likely be searching for a unique experience, consisting of unusual or unseen birds on their list, and therefore would be less satisfied with the relatively common experience (to them) of the Platte spring migration.

Previous experience was also expected to have a bearing on birders' willingness to pay the costs of management outcomes along the Platte. Respondents with satisfying birding experiences previously in the area were considered more likely to be willing to bear the costs of management actions. Yet this expectation is tempered. Given that the benefits of management actions are derived from use and nonuse motivations, the use aspect of

such benefits should be positively related to the willingness to bear management costs. The level of satisfaction derived from previous experiences would not influence nonuse motivations, however. To the extent that respondents birded in the area infrequently, nonuse motivations may dominate their decision to bear management costs. This could complicate our efforts to identify the separate affect of different types of motivation on respondent perceptions of the importance of resource management.

Valuation Scenarios

The valuation scenarios used were constructed to (1) elicit a direct measure of willingness-to-pay from respondents, and to (2) represent all motivations for value. In this case, willingness-to-pay represented a payment to avoid the loss of the current or *status quo* situation. Permutations in the basic scenario allowed for greater and lesser degrees of species diversity and crane populations relative to the current situation. Therefore, the conceptual relationship between "willingness-to-pay" to avoid loss of biological resources relative to a varying reference situation (post-payment level) of items—diversity and cranes—constitutes Hicksian equivalent surplus measures (Brookshire, Randall, & Stoll, 1980). Our approach was directed toward the limited population of birders from which our sample was derived, and omitted the existence valuations that might have been held by the remaining non-birding members of the general population.

The contingent valuation section of the questionnaire began with a discussion of the uniqueness of the Platte River ecosystem, and its importance as a mid-continental staging site for millions of migratory birds. This introductory section was followed by an equally detailed discussion of the importance of the Platte River to Nebraska agricultural interests that depend on the Platte River as a source of irrigation water. Finally, the impact of human manipulation on the Platte River, its riverine ecosystem, and the dependent wildlife was discussed. These sections defined and supported the public policy needs, most succinctly expressed in the statement that "the goal of water management planning in the PRSA is to balance the requirements of urban, agricultural, and environmental interests." This final section clearly established that management actions had not yet been determined, and it was noted that any and all management actions proposed in the future would not be free.

Several scenarios were then presented, with a cost attached to each. Individuals were instructed to evaluate each scenario from their own perspective, and indicate whether they would find the scenario acceptable given the cost figure specified. These scenarios represented a close-ended form of contingent valuation, essentially a form of referendum.

The first scenario described a management program to preserve the present status of the Platte River. Individual costs (bids) varied randomly among all respondents and ranged from $1 to $2,000 annually. Respondents were then presented with a scenario that proposed a change in the diversity of species found in the study area, with all other variables remaining constant. The proposed species variation ranged from a 10, 20, or 30% reduction to a 10, 20, or 30% increase in diversity. Each respondent received a different, randomly chosen variation in species diversity. If respondents answered, "yes" to the initial (*status quo*) scenario, this scenario contained a reduction in species diversity at the same level of management program cost. If respondents answered "no" to the initial scenario, then this scenario contained an increment in species diversity at the same management program cost. Finally, respondents were asked to consider a third scenario that varied Sandhill Crane population levels. The initial (*status quo*) scenario was referenced, and then a scenario where species diversity would remain constant but Sandhill Crane

population would be altered in the same manner as described earlier. Again, the range of management costs was the same. For additional information on scenario wording and background material provided to respondents, see Eubanks, Ditton, and Stoll (1998) or contact the first author.

In essence, following the initial *status quo* or baseline scenario, management program costs presented to the respondents were constant. Therefore, a type of bidding in species and population levels occurred. This design enabled analysis of variations in management costs (offer amounts) across respondents, and variations in diversity and population levels (for both individuals and across the sample), to derive estimates of net economic value (consumer's surplus) for each of the alternative scenarios. This design allowed for the identification and determination of total value estimates for each scenario, as well as estimates of marginal valuations for species diversity and Sandhill Crane population changes.

Results

Of the 1,963 surveys mailed, 1,259 were returned usable for a 64% raw response rate. After removing non-deliverables, the effective response rate was 70%. Most respondents were either crane watchers at the Fort Kearney State Historical Park and Recreation Area (35%) or visitors reserving blinds at the Lillian Annette Rowe Sanctuary (20%). When non-respondents were contacted, interview results indicated no significant differences between their responses and those of respondents on personal characteristics and birding participation.

Personal Characteristics

The average age of Platte River birders was 53. A slight majority (52%) was female. Nearly one-half (47%) of the birders had household incomes of more than $50,000 per year from all sources before taxes with $59,904 reported as the average annual household income overall. Platte River birders appeared to be mostly "empty nesters" with an average household size of 2.34 persons. A strong majority (87%) of birders had attended college or graduate school, with nearly one-half (45%) receiving post-baccalaureate education. Most (96%) were Anglo. Platte River birders were nearly equally distributed across urban (35%), suburban (37%), and rural (28%) residence locations. Forty-four states were represented, with Nebraska the origin of most (52%) visitors.

Most (54%) considered themselves casual birders although 35 and 10% considered themselves active and committed birders, respectively. The casual birder included persons "whose birding is incidental to other travel and outdoor interests and for whom the activity is an enjoyable yet inconsistent outdoor activity." Most (54%) reported birding as only one of many outdoor recreation activities whereas 21% reported birding was their most important activity.

Birding Participation

Platte River birders reported taking 7.3 birding trips (30.9 days) during the previous 12 months. Birders who lived in the PRSA (27%) or elsewhere in Nebraska (21%) confined most of their birding-related travel to the state. Birders that resided in the PRSA averaged 27 days of birding in Nebraska in the previous 12 months. In contrast, those who lived outside of Nebraska (52%) had birded in Nebraska only 4 days during the same time period. Many non-resident birders visited Nebraska only during the crane migration. The

average visiting group consisted of 5.2 persons, with 55% of groups with 2 or fewer persons. The average visiting group traveled by automobile 448 miles one-way to reach the study area.

Trip Expenditures

On their "most recent trip," recreationists engaging in Platte River wildlife observation (primarily birding) averaged $238 in trip-related expenditures within the study area. Those respondents living within the PRSA or other areas of Nebraska spent $121 and $114 within the study area, respectively, whereas those living outside Nebraska averaged study area expenditures of $335 per trip. In addition to expenditures within the PRSA, visitors also spent an average of $48 elsewhere in Nebraska. Thus, total trip expenses for the "typical" visitor to the Platte River Basin area for wildlife viewing were $336 per trip, of which $238 was spent in the study area.

Economic Value

In well-functioning markets, it is normally assumed that the amount paid by a visitor reflects the alternative values that could have been obtained by using the resources for other activities. Thus, the consumer's expenditure is balanced out by other items foregone by society. All that remains is the residual between what the visitor believes the activity is worth and what must actually be paid to engage in it (this net willingness-to-pay is commonly referred to as consumer surplus).

Valuation models. Responses to scenarios were pooled into a common data set using only those individuals who responded to all three valuation scenarios. When pooled, these 1,018 respondents comprised a total data set of 3,054 observations (each having been replicated three times). In the aggregation process, the offer amounts and scenario permutations were assigned to new common variables, allowing for pooled analysis with a single statistical model.

We used logistic regression to estimate the probability of a "Yes" response to a given set of management conditions and the associated management costs (price). The model uses the "Yes" or "No" response as a dependent variable, and independent variables are listed down the left column (Table 1).

All significant coefficient estimates had expected signs (Table 1). We found that the higher the offer amount, the lower the likelihood of a "Yes" response. Respondents with higher incomes were more likely to respond positively to the offered amount. Similarly, the greater the crane population, the higher the likelihood of a "Yes" response. We found the same for commitment. The more committed the birder, as measured by both investment in binoculars and ranking of birding importance, the more likely a respondent was to respond "Yes" to the management scenario and its price. Self-assessed respondent skill as a birder was negatively (and significantly) related to the willingness to bear management costs for a specific management scenario. One unanticipated result was that level of species diversity did not appear to significantly influence willingness-to-pay. The estimated coefficient had the expected sign and indicated a slight influence on the probability of a "Yes" response to the scenario.

Valuation estimates. In reporting estimates of consumer surplus (net economic value), we have chosen to report results for each scenario discussed previously. The estimated means were calculated by numerical approximation over the management cost (offer) variable with an upper bound of $1,000 for the calculations. Although this was less than

Table 1
Logistic regression model for estimation of birders net economic value for MPRSA birding conditions[a]

	Dependent variable is Yes (= 1) or No (= 0) Response of respondent to scenario	
Variable	Estimate	Std. Err.
Intercept	–4.28347**	2.45118
Ln(Offer amount)	–0.29519***	0.02121
Ln(Income)	0.16981***	0.06246
Ln(Percent diversity) (100 = current, 70 = 30% less, etc.)	0.22265	0.33696
Ln (Percent crane population) (100 = current, 70 = 30% less, etc.)	0.59752*	0.33173
Binocular replacement cost	0.00025**	0.00012
Birding skill relative to others (1 = More or equal skill; 0 = Less)	–0.19393**	0.10223
Birding importance (1 = More or 2nd most; 0 = Other)	0.17656*	0.10333
Number of observations	2448	
Missing cases	606	
Log of likelihood function	–1569.772	
Chi-squared statistic	239.029	
Degrees of freedom	7	

[a]Significance levels are denoted as follows: *** = .01 level, ** = .05 level, * = .10 level.

the top offer used in the questionnaire, the estimated relationship was flat at higher offer levels (probable response was unaltered). Using higher bounds for the approximation would only serve to inflate the value estimate due to a wide tail on the estimated relationship. All other variables were set equal to their sample means.

This integration provided an estimate of the mean value of the management cost offer (or an estimate of consumer surplus). The expected value of this management cost served as a proxy for the threshold value of the additional expenditure that totally extracted the consumer surplus. In other words, this represented the amount that would cause the birder to decide that preservation of the PRSA for its "birding-related resource values" no longer justified the expenditure that would need to be incurred. The estimated median value for each scenario is reported for comparative purposes.

The range of value estimates is reported for permutations in species diversity and Sandhill Crane populations from 70 to 130% of current levels (Table 2). Although it is well-known that biodiversity is integral to ecosystem stability and health (Wilson, 1992), it is clear from these estimates that our respondents were most interested in the *abundance* of Sandhill Cranes and had little interest in species *diversity*. Whereas annual net willingness-to-pay for the current situation was estimated to be $413, this was reduced to $363 when Sandhill Crane numbers dropped by 30% but only to $394 when species diversity dropped by 30%. Likewise, annual net willingness-to-pay only increased to $427 when

Table 2
Value estimates for changes in species diversity and crane populations

	Species diversity			Crane population		
Percent of current level	Estimated mean value	Estimated marginal value per 10% change	Estimated median value	Estimated mean value	Estimated marginal value per 10% change	Estimated median value
70	$393.99		$83	$363.28		$50
		$6.95			$18.21	
80	$400.94		$92	$381.49		$69
		$6.17			$16.34	
90	$407.11		$101	$397.83		$88
		$5.54			$14.82	
100	$412.65		$109	$412.65		$109
		$5.03			$13.55	
(baseline situation)						
110	$417.68		$117	$426.20		$132
		$4.62			$12.47	
120	$422.30		$125	$438.67		$158
		$4.25			$11.54	
130	$426.55		$133	$450.21		$186

species diversity increased to 130% of its current level but increased to $450 when Sandhill Crane numbers increased by a comparable percentage. The lack of significant influence of species diversity on respondent valuations reinforces the often-made argument that the "general public" has little recognition of the role played by individual species in an ecosystem relative to overall species diversity (Holsman, 2000).

Most respondents were interested in the Platte River study area for its general wildlife entertainment value. These were not high commitment or skilled birders. Many came to the Platte to enjoy a general nature experience they believed was embodied in the Sandhill Cranes flocking to the river. Although they were concerned with wildlife diversity, their valuation of PRSA wildlife resources was less associated with that complex aspect of the resource base. Additionally, Table 2 indicates the marginal contribution to willingness-to-pay made by variations in species diversity and crane populations. A 10% increment (decrement) in species diversity from the current (baseline) situation makes a marginal increase (decrease) to annual willingness-to-pay of roughly $5. A similar change in the Sandhill Crane population provides a marginal change in willingness-to-pay of roughly $14 to annual value. Not only do these differences in magnitudes for the marginal contributions reflect the previous discussion, they are also consistent with economic theory in that the value of successive increments leads to greater total willingness-to-pay but with declining value increases (diminishing returns). Although the estimated median values are lower than the means (Table 2), using the former to estimate marginal values would yield comparable magnitudes. This is encouraging as they are often of greater interest than total resource values. That is, policy changes are incremental in nature and rarely an all-or-none proposition.

Lingle (1992) estimated annual birder use for the Platte River area at approximately 80,000. Our estimates of annual birder use were in the order of 14,500 to 22,715 persons depending on approach used. The difference of roughly 60,000 persons between our numbers and those of Lingle are likely due to day trippers using roadside sites and other areas throughout the region. We undersampled these often less purposeful bird observation trips; yet, all were resource-related trips. To demonstrate the usefulness of our results from a policy perspective, we adopt the aforementioned figure from Lingle (1992). Estimates for other birder population levels are presented in Table 3.

In today's economy, a discount rate of 7% is quite reasonable for the valuation of reservoir development projects. Given our estimate of $413 for the respondent willingness-to-pay to maintain the current resource situation, what is the value of the asset that supports this birding activity? If it were lost, what is the lost asset value? When aggregated to over 80,000 people and discounted at 7% over a 50-year life, this asset value would amount to $456 million (Table 3). Although it can be argued that asset value in this case would more appropriately be estimated over an infinite time horizon, this would only increase the total asset valuation by an additional $15 million. This value is a clear underestimate, capturing primarily use value placed on the resources (although not exclusively so) for a limited number of people. One could argue economic value in this unique resource setting is held by a much wider array of national and international citizens.

Marginal changes in resource configurations are more likely the case. The second part of Table 3 presents information for several selected situations: a 10% loss in species diversity, a 20% gain in species diversity, a 20% loss in Sandhill Crane population, and a 10% gain in Sandhill Crane populations. Several points are apparent from these calculations. First, small valuations, when aggregated over large numbers of people and over time, can lead to significant magnitudes. Second, from the perspective of "the public" represented by study respondents, programs that provide greater numbers of Sandhill Cranes (or to avoid

Table 3
Example of asset and hypothetical policy option valuation

Type of example	Birder population estimate	Annual net willingness--to-pay	Aggregate annual net willingness--to-pay	Discount rate	10-year value	50-year value	Infinite life
Resource asset valuation							
Low birder estimate	14,500	$412.65	$5,983,425	0.07	$42,025,073	82,575,730	85,477,500
Medium birder estimate	22,717	$412.65	$9,374,170	0.07	$65,840,248	129,370,543	133,916,715
High birder estimate	80,000	$412.65	$33,012,000	0.07	$231,862,474	455,590,237	471,600,000
Hypothetical policy changes							
10% loss in species diversity:							
Low birder estimate	14,500	$5.54	$80,330	0.07	$564,204	1,108,614	$1,147,571
Medium birder estimate	22,717	$5.54	$125,852	0.07	$883,933	1,736,854	$1,797,888
High birder estimate	80,000	$5.54	$443,200	0.07	$3,112,851	6,116,491	$6,331,429
20% gain in species diversity:							
Low birder estimate	14,500	$9.65	$139,925	0.07	$982,775	1,931,069	$1,998,929
Medium birder estimate	22,717	$9.65	$219,219	0.07	$1,539,703	3,025,386	$3,131,701
High birder estimate	80,000	$9.65	$772,000	0.07	$5,422,205	10,654,176	$11,028,571
20% loss in Sandhill Crane population:							
Low birder estimate	14,500	$31.16	$451,820	0.07	$3,173,395	6,235,453	$6,454,571
Medium birder estimate	22,717	$31.16	$707,862	0.07	$4,971,725	9,769,020	$10,112,310
High birder estimate	80,000	$31.16	$2,492,800	0.07	$17,508,384	34,402,500	$35,611,429
10% gain in Sandhill Crane population:							
Low birder estimate	14,500	$13.55	$196,475	0.07	$1,379,958	2,711,502	$2,806,786
Medium birder estimate	22,717	$13.55	$307,815	0.07	$2,161,966	4,248,082	$4,397,362
High birder estimate	80,000	$13.55	$1,084,000	0.07	$7,613,562	14,960,009	$15,485,714

their loss) are much more easily supported. And third, economic information like this can lend useful support to arguments for conservation of biologically unique resources.

Overall, birders were estimated to place a $413 value on maintaining the current *status quo* situation in terms of species diversity and size of the crane population. That is, if the alternative were to lose the resource base on which this unique, biologically diverse system depended, respondents were willing-to-pay an additional $413 annually to avoid this loss. Aggregated to the estimated annual population of birders in the study area, this would amount to a magnitude on the order of $33 million annually. Discounted over a 50-year horizon at 7%, the asset value of this resource to birders was in the neighborhood of $472 million. Although it is not likely that this asset would be totally lost, it is not far-fetched to imagine that programs to avoid a 10% decline in species diversity would be contemplated and that taxpayers would have to pay the bill. In this case, our marginal estimate of $5.54 to avoid a 10% species diversity loss would amount to $443,200 annually or a present value of roughly $6 million calculated over 50 years using a 7% discount rate. Or, alternatively, a program might be considered to enhance Sandhill Crane population by 10%, in which case, the marginal value of $13.55 would lead to a 50-year discounted value of $14 million. Thus, if the costs of such programs had present values less than these amounts, the economic evidence would tip the scale in the direction of their support.

Scenario results were driven more by the *size* of the bird population than by species *diversity* concerns. This was attributed to the more generic birder clientele attracted to the Platte at this time of the year to view the birding spectacle. This may encourage decision-makers to lean toward serious birders when looking for biodiversity policy and financial support. Our results emphasize that not all "birders" were equal. There are significant differences and, in this case, it is clear that the predominant visitor to this region was not the highly skilled birder. Skilled birders likely find the spring "fly-in" interesting and worthwhile but not one of their most preferred birding attractions. It was the more casual or novice birder that found the Platte River birding experience to be highly prized and who indicated a high level of satisfaction and interest in returning again.

Discussion

There are several implications of this research for the practice of economic evaluation and future natural resources decision-making in the Platte River and elsewhere. First, how does this research integrate with previous valuation work and has any new ground been broken? Second, what do the economic valuation results mean with regard to past, present, and future decision-making on the Platte River, and what are the limitations of these results in natural resource development decision-making?

Although economic valuation of environmental resources is not new, there are several aspects of this study that were somewhat unique. The design of the survey was akin to what have come to be called "contingent choice" methodologies (Turner, 1999). These approaches utilize a variety of trade-offs to elicit information about relative contributions of package components. In these approaches, financial costs are one of several characteristics used in scenario development. Our study was similar in that it was a contingent valuation approach utilizing multiple variations in scenario features.

Our focus here was not on total resource values but more importantly, on marginal values of resource setting/experience components. The purpose of the design was to get policy-useful marginal valuations for resource characteristics. Accordingly, we have created a blend of traditional dichotomous choice, contingent valuation and the newer contingent choice methodologies.

In this article, we provided a quick overview of birder expenditures. These are not the value of the resources but rather the costs of resources used to enjoy natural resource dependent experiences. Although useful from a regional impact perspective, they also often represent the shifting of expenditures from one region to another and, from a national perspective, are largely self-canceling. Thus, the true value of PRSA resources is best represented by *net willingness-to-pay*. This latter measure can be used to evaluate the merits of alternative resource management programs. This is the kind of information that must be available to facilitate the conservationists' debate with others about the merits of particular public sector developments.

Dam reauthorization within the Platte River region in today's social and political climate is significantly different than when they were originally constructed. Today, Federal agencies must consider the impacts of altered flowage conditions on all citizens and the natural environment, and not just consider benefits associated with water storage. Under the National Environmental Policy Act (42 USC 4321–4375), these externality costs must be taken into account when evaluating the best use of societal resources.

Each acre foot of water stored for later use is an acre foot that does not flow in the Platte River. This will impact the riverine environment, affect wildlife populations, and, accordingly, the benefits received by citizens engaged in both consumptive and non-consumptive recreational pursuits. These benefits should have been compared with the benefits of alternative water use when water projects were built (but agencies were not authorized to do so). Today, alteration of the benefits from these recreational pursuits is a cost of reduced flowage. There are, in fact, significant economic values associated with maintaining the natural status of existing rivers (or of even reverting back to a more natural status). These values are both non-market and market in character. No longer must conservationists enter the policy arena and debate without economic tools at their disposal.

In this article, we have not measured the full value of the Platte River ecosystem. Our estimates are mercilessly imprecise in various ways. First, as values collected from individuals, they are only as good as the understandings possessed by those individuals. Birders can give a conservative value as a starting point but these values are nevertheless limited. We know these values exist and that individuals with varying degrees of familiarity with the resource are capable of expressing them. It is also clear that many respondents lack an understanding of the importance of biodiversity relative to individual species values, unlike someone trained in conservation biology. A good case can be made for more educational efforts to enhance general birders' understandings in this regard.

Further, our citizens' limited understanding of ecosystem complexity is a constraint to society's ability to judge the need for sustaining the natural resources of the Platte River ecosystem. Because this resource base is critical for the major migration of birds throughout North America, a risk-averse approach seems justified. In this regard, our value estimates are not so precise that they should give those involved in decision-making a sense of misplaced confidence. If conservation policy can be shown to make good economic sense given the magnitude of our estimates, then conservation policy would appear to be a wise course of action. Alternately, if resource development appears to make economic sense using our estimates, we do not believe one should feel too comfortable pursuing that course of action. Too much is left out of our estimates to allow for complacency—our estimates are not encompassing enough for irreversible resource development decisions but do allow comfort for conservation decisions that can be altered later.

As social scientists, we are not so naive as to presume we know the full economic value of a natural system. We know it has value and can provide a conservative estimate of this value—and this may be enough for answering questions as to why resources should

be sustained rather than be put to alternative use. Clearly, the role of social scientists should be to complement the work of biological and ecological colleagues.

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