Would County Residents Vote for an Increase in Their Taxes to Conserve Native Habitat and Ecosystem Services? Funding Conservation in Palm Beach County, Florida.

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January 2019

JEL Codes: Q51, Q58

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ABSTRACT

In the 1990s, residents of Palm Beach County, Florida, voted in favor of two bonds to finance the acquisition and restoration of lands of environmental concern. In total, 31,445 acres of native habitat were conserved to create the Natural Areas Program. These lands protect both biodiversity and ecosystem services, including open space amenities, outdoor recreation, and flood protection in urban and peri-urban areas. In 2015, county staff determined that a dedicated source of funding (~$6.4 million per year) is required to maintain these natural areas. These funds would pay for continued revegetation of natural areas, removal of invasive plants, maintenance of recreation infrastructure, parking lots, fences, and signs, the provision of educational materials for visitors, and the monitoring of habitat, plants and animals to maintain ecosystem health. Palm Beach County's Department of Environmental Resources Management asked us to determine what value residents place on the Natural Areas Program and ecosystem services it provides. In 2017, we administered a stated preference choice experiment to residential property owners in Palm Beach County. Taking preference heterogeneity into account, we determined that allowing the natural areas to become degraded would likely reduce the welfare of 82% of respondents. Respondents were heterogeneous in terms of the value they placed on habitat conservation and ecosystem services. Our results suggest that Palm Beach County should hold a referendum on continued financing of the Natural Areas Program.

KEY WORDS: stated preference choice experiments, random parameters logit, latent class analysis, ecosystem services, recreation, habitat, flood risk

INTRODUCTION

The integration of biodiversity and ecosystem services into policy and program design is an ongoing challenge (Daily et al., 2009; Laurans et al., 2013; Mäler et al., 2008; Ring et al., 2010; Ruckelshaus et al., 2015; Waite et al., 2015). Ecosystems, and the services they provide, generate ecological, socio-cultural and economic value (de Groot et al., 2010). While the Millennium Ecosystem Assessment highlighted the critical links between policies, environmental quality, ecosystem services and human well-being, both biodiversity and ecosystem services continue to decline because the value of conserving biodiversity and ecosystem services is often not incorporated into political and economic decision making (Ring et al., 2010).

The challenge that government officials and policymakers face is that the benefits of biodiversity and ecosystem services are typically public goods and non-market externalities that accrue to society at the local and global level (Costanza et al., 2014; Ring et al., 2010). In contrast, land-use changes (and associated loss of biodiversity and ecosystem services) are presented as beneficial for local economic growth and job creation. Although the immediate private benefits of habitat conversion are unlikely to outweigh the larger social costs of degraded or lost ecosystem services, political exigencies may result in suboptimal decisions with respect to the conservation of biodiversity and ecosystem services. As a result, highly productive, multi-functional natural and semi-natural landscapes and ecosystems that generate multiple ecological, socio-cultural and economic values are converted to single-function land uses that generate less total value (de Groot et al., 2010).

It has thus been argued that valuation of biodiversity and ecosystem services is critical to demonstrating their importance in securing human welfare (Balmford et al., 2002; Costanza et al., 2014; Daily et al., 2009). For example, the Economics of Ecosystems and Biodiversity

(TEEB) study advocated for the valuation of biodiversity and ecosystem services to better inform decision-making. However, valuation is insufficient to ensure conservation unless these valuations are actually used to design appropriate policies to secure biodiversity and ecosystem services (Turnpenny et al., 2014). There is increasing recognition of a policy-science gap, whereby information about, and valuation of, biodiversity and ecosystem services is not used in the design and implementation of government policies (Fisher et al., 2008; Laurans et al., 2013; Liu et al., 2010; Ruckelshaus et al., 2015; Waite et al., 2015). A study by Waite et al. (2015) found that while over 100 valuations of coastal ecosystem services have been conducted in the Caribbean, only 17 studies had an observable influence on policy, management, or investment decisions. Moreover, valuations have tended to focus on securing a single ecosystem service, rather than securing multiple services (Ruckelshaus et al., 2015).

In those cases where valuation has informed decision-making, scientists (specialists) have worked with decision-makers (generalists) to ensure that data collection and analysis meet local needs, and that "knowledge production processes are deemed credible, relevant and legitimate by stakeholders" (Ruckelshaus et al., 2015: 12). Other enabling conditions that result in valuation studies influencing decision-making include: a clear policy question; clearly defined authorities; strong leadership and stakeholder engagement; effective communication; access to decision makers; transparency in reporting results; and demonstrated interest in using ecosystem service information in decision-making (Ruckelshaus et al., 2015; Waite et al., 2015).

THE PALM BEACH COUNTY NATURAL AREAS PROGRAM

Given the prevailing trend for policymakers to omit biodiversity and ecosystem services from their decision-making, it is interesting to note that local government in Palm Beach County,

Florida, has factored ecosystem services and biodiversity into decisions about habitat conservation. In the 1970s and early 1980s rapid development of Palm Beach County resulted in the loss of subtropical native ecosystems, including globally-imperiled ecosystems. Concerned by the rapid rate of development in the county, the Coalition for Wilderness Islands recommended that Palm Beach County should establish a program to preserve examples of the best remaining native ecosystems in the county. This concept was unanimously approved by the Board of County Commissioners, and an inventory of remaining native ecosystems was used to identify areas to acquire and restore. Habitats were selected based on their existing and potential ecological value, and are located in urban and peri-urban areas. In implementing the Natural Areas Program, Palm Beach County took an important step towards "conserving and restoring ecosystem services in urban areas [which] can reduce the ecological footprints and the ecological debts of cities while enhancing resilience, health, and quality of life for their inhabitants" (Gómez-Baggethun & Barton, 2013: 235).

To fund this effort, two bond referenda were included as part of the 1991 and 1999 county elections. Sixty-seven percent of voters approved US$150 million in bonds to "acquire, preserve and protect environmentally sensitive lands in Palm Beach County and protect wildlife and endangered species on such lands". The County acquired and restored 33 sites, which encompass 31,445 acres of native habitat (e.g. scrub, cypress swamps, pine flatwoods, wetlands). These natural areas are managed to: protect surface water and groundwater quality and quantity; create conservation greenways and wildlife corridors; provide opportunities for recreation (e.g. hiking and bird watching) that will not degrade native ecosystems; protect endangered, threatened, and rare species of plants and animals; and protect biological diversity. The Palm Beach County Natural Areas Program is run by the county's Department of Environmental

Resources Management (ERM), which is tasked with conserving the multiple ecosystem services generated by the Natural Areas Program.

The Natural Areas Program is consistent with the ecosystem services approach to land-use planning, specifically green infrastructure (Cowell & Lennon, 2014; Lennon, 2015). Green infrastructure, a development approach that has been promoted in the United States, United Kingdom and European Union, is defined as a "network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustains clean air and water, and provides a wide array of benefits for people and wildlife" (Benedict & McMahon, 2006: 1; see also Comhar, 2010). Green infrastructure has been positioned as a solution to the development problems of providing and protecting ecological networks, green space, biodiversity, and recreational facilities, as well as providing flood protection (Cowell & Lennon, 2014). While this development approach is a potentially important means to attain the conservation of ecosystem services and biodiversity, the success of green infrastructure depends on securing sustained financing to manage natural areas and open spaces.

In Palm Beach County all bond finances have been expended in acquiring, restoring and managing the Natural Areas Program. The county requires a dedicated source of funds to continue managing these areas. On average, the county spends US$6.4 million per year on the Natural Areas Program. These funds pay for: revegetation and removal of invasive plants; maintaining recreation infrastructure, parking lots, fences, and signs; providing educational materials for visitors; and monitoring habitat, plants and animals to maintain the ecosystem health of the natural areas. Recent estimates suggest that an annual payment of ~US$15 from residential property owners should supply the necessary funds to maintain the Natural Areas Program.

To ascertain whether county residents would support this annual payment, ERM commissioned a study on residents' valuation of habitat conservation and ecosystem services provided by the Natural Areas Program, and their willingness to pay towards maintaining the natural areas. In commissioning this study, ERM recognized that county residents are likely to ascribe different values to the benefits provided by the Natural Areas Program. ERM also recognized that there is likely heterogeneity of preferences across county residents with respect to biodiversity and ecosystem services conservation, and funding conservation efforts. Although Palm Beach County is noted for its affluence (in particular the number of wealthy individuals who own real estate in the county), it also has a relatively high percentage of individuals aged 65 years or older (23.3% of the county population in 2016[1]) who may be living on a pension or may not be physically active. Accounting for heterogeneity of preferences is important for incorporating equity considerations into the design of policies and programs to conserve biodiversity and ecosystem services (Boxall and Adamowicz, 2002; Birol et al., 2006; Gómez-Baggethun & Barton, 2013). Accordingly, we tested for preference heterogeneity as part of our valuation study, although we recognized that this would increase the complexity of the analysis. The design and results of this study are presented below.

METHODS

Survey Design

ERM requested that we ascertain the value that county residents place on the following attributes of the Natural Areas Program: type of habitat protected; recreational opportunities provided; and flood protection. We designed a multi-profile stated preference choice experiment

[1] Source: https://www.census.gov/quickfacts/fact/table/palmbeachcountyflorida,FL/PST045216

(SPCE, Adamowicz et al., 1998; Louviere et al., 2015) where respondents were shown three different profiles. All profiles (hereafter referred to as 'programs') included different levels of the program attributes and an annual tax that the respondent would be expected to pay to maintain the ecological integrity and infrastructure of the Natural Areas Program (Table 1). Alternatively, respondents could refrain from choosing any of the three programs as shown in the choice scenario (i.e. the respondent could choose not to vote in favor of funding continued maintenance of the Natural Areas Program). We refer to this latter decision as the 'opt-out' choice for the given scenario. Utilizing a dichotomous choice SPCE design, we asked respondents which profile they would vote for, or whether they would choose not to vote to maintain the Natural Areas Program (see Figure 1).[2] As such, for the purposes of this research we define the 'Natural Areas Program' only in terms of protected habitat, recreational opportunities, and flood protection. We omit other potential benefits provided by this program, such as improved water quality and aesthetic value.

To reduce participant cognitive burden, we used a balanced block design (Bech et al., 2011) to generate three survey blocks for each design that contained four choice scenarios. The

[2] As part of the introduction to the SPCE questions, respondents were provided with the following instructions: "We will now ask you four questions about your preferences related to the county's natural areas and whether you would pay to maintain the Natural Areas Program. If you choose not to vote for any of the options then you are choosing <u>not</u> to maintain the Natural Areas Program. If you vote for one of the programs, then you are providing information about which ecosystem services are important to you, and how much you would pay to maintain the Natural Areas Program."

Table 1: Attributes and attribute levels for the stated preference choice experiments

Attribute	Attribute levels
Native habitat	Forest Wetlands Scrub
Recreation opportunity	**Paved trails** for walking, bird watching, and nature appreciation **Dirt trails** for bicycling, horseback riding, hiking, and physical fitness **Kayak ramps** that allow visitors to canoe and kayak on rivers and in the wetlands
Flood protection	**No reduction** in flood risk, i.e. the probability that properties in the flood plain will flood at least once every 30 years remains 26% **1% reduction** in flood risk, i.e. the risk of flooding falls to 25% **2% reduction** in flood risk, i.e. the risk of flooding falls to 24%
Annual tax	$15 $30 $60 $100

Figure 1: Example of a stated preference choice experiment included in the survey

Please consider the following three programs:

	PROGRAM 1	PROGRAM 2	PROGRAM 3
Protected habitat	Wetland	Scrub	Forest
Recreation opportunity	Kayak ramps	Paved trails	Dirt trails
Flood risk	2% reduction	1% reduction	No reduction
Annual tax	$15	$100	$30

If a referendum was held tomorrow, would you vote for one of the above programs? *Circle **ONE** number.*

1 **YES** on Program 1
2 **YES** on Program 2
3 **YES** on Program 3
4 I would vote **NO** on paying for the Natural Areas Program

experimental design was created using a main-effects model with a criterion that maximized D-efficiency (Street et al., 2005). The D-efficiency associated with this design[3] was 92.16.

One of the key challenges in designing the survey was to ensure that descriptions of the program attributes were easy to understand and accurately captured the actual benefits provided by the Natural Areas Program. This was important to reduce the uncertainty associated with stated preference techniques (see Pascual et al., 2010). We used color photos of three different sites to demonstrate what was meant by forest, wetlands, and scrub habitat. Given the number of outdoor recreation activities that are facilitated by the Natural Areas Program, we described the outdoor recreation attribute in terms of the recreation infrastructure provided and the activities permitted by this infrastructure. Respondents were informed that paved trails allow for walking, bird watching, and nature appreciation, while dirt trails allow for bicycling, horseback riding, hiking and physical fitness. Respondents were also informed that kayak ramps allow for canoeing and kayaking on rivers and in the wetlands. These descriptions were written to ensure that the recreation attribute was separable in levels. Because scrub habitat does not contain surface water, it does not allow for water-based recreational opportunities. To ensure that scrub habitat was only combined with paved trails and dirt trails, we restricted[4] the choice experiment design using the SAS %MktEx macro to exclude such unrealistic scenarios.

Flood protection was a particularly challenging attribute to describe. Based on information from the Federal Emergency Management Agency (FEMA), respondents were informed that over half the county is in a floodplain. Because the average individual does not

[3] The blocks were created using the %MktEx macro in the SAS statistical software package (Version 9.4)

[4] SAS %MktEx Macro restrictions - https://support.sas.com/techsup/technote/mr2010mktex.pdf

understand what is meant by a 100-year flood, respondents were informed that "There is a 26% chance that properties in floodplains will flood at least once during a 30-year period (the average length of a residential mortgage). Properties outside the floodplain are also at risk of flooding" – information that was consistent with FEMA documentation. Respondents were further informed that natural areas protect people and their properties from floods by absorbing heavy rains and storm water runoff. To avoid overstating the flood protection provided by the Natural Areas Program, we calculated what share of the floodplains was protected by the program, and used this to set the attribute levels at: no reduction in flood risk; a 1% reduction in flood risk; and a 2% reduction in flood risk. We explicitly stated that no reduction in flood risk meant that the probability that properties in the floodplain would flood at least once in a 30-year period would remain 26%, but a 1% reduction in flood risk would reduce this probability of flooding to 25%. Pre-tests[5] of the choice experiment design confirmed that respondents understood this description of flood protection. A summary of all attributes and their corresponding levels is provided in Table 1.

During discussions with ERM, we were informed that a flat increase in property taxes (~US$15 per year) should be sufficient to finance the Natural Areas Program. This funding mechanism would allow the county to allocate monies collected to the maintenance of natural areas. The use of monies collected via a bond or sales tax would be restricted to capital investments or improvements, which do not encompass activities such as revegetation and

[5] We pre-tested the survey with 20 residents and property owners in Palm Beach County using one-on-one cognitive interviews and group-based surveys (during which individuals completed draft questionnaires on their own, followed by a discussion). We also pre-tested the survey with 6 experts in survey design and 4 economists who are experts in the implementation of SPCEs.

removal of invasive plants, and monitoring habitat, plants and animals to maintain the ecosystem health of natural areas. Accordingly, we included an annual tax increase in the SPCE questions (between US$15 and US$100 per year).

Survey Implementation

We used both mail-based and online surveys to collect data from Palm Beach County residents. A total of 2,500 surveys were mailed to residential property owners. Because ERM proposed to implement a property tax increase, residential property owners were the appropriate stakeholder group to survey, in order to improve the quality of the economic valuation (see Pascual et al., 2010; Waite et al., 2015).

The design of our sample frame was based on property appraisal records from the 2016 tax year. These records included addresses and ownership records for 186,439 condominiums (apartments) and 358,876 single family residences. The mean property value was $276,131 (first quartile = $113,680, median = $194,357, third quartile = $308,138). We stratified properties by value and randomly selected 625 addresses for each quartile of property values. We used the Dillman Tailored Design Method (Dillman et al., 2014) to administer the mail-based survey. Announcement postcards were mailed out on March 28, 2017, and the survey was mailed out on April 4, 2017. We mailed out reminder postcards on May 2, 2017, and surveys were mailed to non-respondents on May 22, 2017. In total, 438 surveys were returned (17.5% response rate).

We also administered the survey online using a marketing firm (Qualtrics) that recruited an additional 260 residential property owners in Palm Beach County (38% completion rate, which is considered good for an opt-in panel; see Kreye et al. 2018). Our sampling frame was residential property owners, with sampling quotas established according to Census data for the

county (gender, age, education and income level). While it was necessary for the marketing firm to adjust these quotas to meet the requested sample size of 250 residential property owners, the final sample was more representative of the Census in terms of demographics than the mail-based survey. The entire data collection process lasted from March 28 to June 27, 2017.

A total of 696 surveys were returned, of which 434 (62.4%) were implemented by mail and 262 (37.6%) were implemented online. Prior to empirical estimation, we removed 38 surveys with incomplete choice experiment responses (i.e. surveys for which respondents did not complete all SPCE questions) from the data set. We also removed surveys if respondents did not provide responses to questions that were used in the empirical estimation (e.g. demographic variables were missing). Accordingly, we used a total of 10,336 choices from 646 surveys (92.8% of all returned surveys) to estimate regression models. We used STATA Version 14 to estimate all models.

Analysis of the SPCE Questions

Initially, we analyzed the SPCE data using the standard multinomial logit model (MNL), the foundation for the analysis of discrete choice modeling. Respondents' choices were modeled using a random utility maximization framework (McFadden, 1973). We specified the latent utility (U) that respondent *i* derives from each program (or choice profile) *j* as the sum of a systematic, known component (V) and a random component (ε):

$$U_{ij} = V_{ij} + \varepsilon_{ij}$$

Assuming linear utility, V_{ij} takes the form

$$V_{ij} = \boldsymbol{X}'_{\boldsymbol{ij}}\boldsymbol{\beta}$$

where $\mathbf{X_{ij}}$ is a vector of the attribute levels (type of habitat conserved, Habitat; outdoor recreation opportunity, Recreation; change in flood risk, Flood; annual tax, Tax) for profile *j*, and $\boldsymbol{\beta}$ is the vector of attribute coefficients. Following Hensher et al. (2015), we used effects coding to enter Habitat, Recreation and Flood into the model, whereby an attribute with two levels took a value of -1 if it was not present in the profile and a value of 1 if it was present in the profile. Scrub was set as the base level for Habitat, such that the coefficients on the wetlands and forest habitat types should be considered the utility that respondents derived from these habitat types relative to scrub. Similarly, kayak ramps were set as the base level for Recreation, and no reduction in flood risk was set as the base level for Flood. Accordingly, the utility function took the form:

$$V_{ij} = \mathbf{X'_{ij}\boldsymbol{\beta}} = \beta_0 + \beta_1 \cdot \text{Forest}_{ij} + \beta_2 \cdot \text{Wetlands}_{ij} + \beta_3 \cdot \text{Dirt trail}_{ij} + \beta_4 \cdot \text{Paved trail}_{ij}$$
$$+ \beta_5 \cdot \text{Flood reduction}_{ij}^{1\%} + \beta_6 \cdot \text{Flood reduction}_{ij}^{2\%} + \beta_7 \cdot \text{Tax}_{ij}$$

where 'Forest' and 'Wetlands' captured which habitat types were present in profile *j*, 'Dirt trail' and 'Paved trail' captured which recreation infrastructure was present in profile *j*, and 'Flood reduction$^{1\%}$' and 'Flood reduction$^{2\%}$' captured the change in flood risk in profile *j*. An alternative, equivalent approach would have been to enter the attributes into the estimated models using dummy coding, which set the baseline levels for the attributes equal to zero (Louviere et al., 2000; Bech & Gyrd-Hansen, 2005; for a discussion of the relative merits of these two approaches see Daly et al., 2016).

Assuming that individuals maximize utility, individual *i* will choose program *j* if the utility associated with program *j* exceeds the utility derived from other programs (including discontinuing maintenance of the Natural Areas Program), i.e.

$$U_{ij} \geq \max\{U_{i1}.....U_{ik}\}, \text{ k}\neq\text{j}$$

Finally, assuming that error terms follow a type I extreme value distribution, the probability that individual *i* will select program *j* is given by:

$$\Pr(\text{individual } i \text{ chooses program } j) = \frac{\exp(\mathbf{X}_{ij}'\boldsymbol{\beta})}{\sum_{k \neq j} \exp(\mathbf{X}_{ik}'\boldsymbol{\beta})}$$

The multinomial logit model makes a number of restrictive assumptions that are unlikely to hold in reality, in particular the assumption of homogeneity of preferences across individuals. In order to model preference heterogeneity, we used both the random parameters logit (RPL) model and the latent class model (LCM) to analyze the SPCE data.

In the RPL model, the coefficients $\boldsymbol{\beta}$ vary across individuals, but are constant across each individual's choices, i.e. we assume stable preferences for each individual. Because the model allows for preference heterogeneity, the vector of random parameters $\boldsymbol{\beta}$ has a mean and variance – which captures heterogeneity across respondents. A lognormal distribution was imposed on the coefficient for Tax (Scarpa et al., 2008), and normal distributions were imposed on the beta coefficients for all other program attributes. The RPL was estimated in willingness-to-pay space using maximum simulated likelihood (see Hole & Kolstad, 2012; Scarpa & Rose, 2008; Train & Weeks, 2005). We used 500 Halton draws to simulate the log likelihood function.

In contrast to the RPL model, the LCM captures heterogeneity of preferences through discrete parameter variation (Greene & Hensher, 2003; Swait, 1994). The LCM posits that respondents' choices between programs depend on the observable attributes of the program, observable attributes of respondents, and latent, unobservable heterogeneity in respondents' preferences. We used respondent characteristics (e.g. demographics, importance respondents placed on ecosystem services provided by the Natural Areas Program) to allow for discrete

segmentation based on homogeneous preferences within segments (Boxall & Adamowicz, 2002). We used the expectation maximization algorithm to estimate the LCM model (see Bhat, 1997).

The estimated beta coefficients, or marginal utilities, obtained from the LCM have no directly interpretable meaning due to the ordinality of utility. As such, we converted these estimates to respondents' willingness to pay (WTP) for each program attribute using a simulated approach, the Krinsky-Robb method (1000 iterations; see Hensher et al., 2015 and Ortega et al., 2011 for further details on using the Krinsky-Robb method to derive WTP for the effects-coded LCM model).

RESULTS

Descriptive statistics

The majority of respondents (52.7%) were female, and the median age category for respondents was 55 to 64 years old (Table 2).[6] There was a significant difference in the distribution of respondents' ages across the mail-based and online surveys (χ^2=77.677, p<0.001). The median age category for mail-based survey respondents was 65 to 74 years, while the median age category for the online survey respondents was 45 to 54 years. The median education level for all respondents was a Bachelor's degree. Respondents' median household

[6] Based on 2016 Census data, females accounted for 51.7% of the total county population. The median age of residents was 44.5 years, and the median household income was $56,664 per year. We oversampled older residents. In other respects our sample was consistent with Census data (https://datausa.io/profile/geo/palm-beach-county-fl/#, https://www.census.gov/quickfacts/fact/table/palmbeachcountyflorida/PST045216, accessed October 15, 2017).

income before tax was $50,000 to $99,999. Although both median education and income levels were the same across the mail-based and online samples, there was a significant difference in the distribution of these variables (χ^2=14.26, p<0.001 for education level; χ^2=22.06, p<0.001 for income level). The online survey provided greater representation of county residents with lower income and education levels.

The median length of time that respondents had lived in Palm Beach County was 11 to 20 years (Table 2). The majority of respondents (91.4%) lived in Palm Beach County fulltime and owned only one residential property in the county (89.7%). Respondents with multiple residential properties in the county owned an average of two properties. A total of 289 respondents (41.5%) paid flood insurance in Palm Beach County, and 99 respondents (14.2%) stated that they own a residential property that is located near a natural area.

When asked whether they would like to live next to the three habitat types presented in the survey, the majority of respondents (65.9%) stated that they would 'probably' or 'definitely' like to live next to forest, whereas only 42.1% and 40.0% of respondents would like living next to a wetland or scrub (see Table A1 in the Appendix). A total of 473 respondents (68.0%) had visited a natural area in Palm Beach County in the past year. On average, respondents stated that they and/or their household members hike or walk 'every month' (see Table A2 in the Appendix). They were less likely to engage in bicycling or bird watching (median response of 'sometimes'). The majority of respondents 'never' engaged in riding horses (73.9%), kayaking or canoeing (51.7%), and 46.8% of respondents 'never' engaged in fishing. Other outdoor recreation activities, in which respondents engaged, that are facilitated by the Natural Areas Program included: nature appreciation, picnicking, paddle boarding, running, and photography.

Table 2: Demographic characteristics of respondents (N = 696)

	Aggregate Sample		Mail-Based Sample		Online Sample	
	No.	**%**	**No.**	**%**	**No.**	**%**
How many years have you lived in the county?[a]						
5 years or less	93	13.4	53	12.2	40	15.4
6 - 10 years	83	11.9	44	10.1	39	15.0
11 - 20 years	180	25.9	106	24.3	74	28.5
21 - 30 years	153	22.0	97	22.2	56	21.5
More than 30 years	170	24.4	126	28.9	44	16.9
No answer	17	2.4	10	2.3	7	2.7
Do you live in Palm Beach County fulltime?						
Fulltime	637	91.5	399	91.5	238	91.5
Part of the year	41	5.9	26	6.0	15	5.8
No answer	18	2.6	11	2.5	7	2.7
Do you own more than one residential property?						
No	625	89.8	386	88.5	239	91.9
Yes	62	8.9	41	9.4	21	8.1
No answer	9	1.3	9	2.1	0	0.0
Do you pay flood insurance?						
Yes	288	41.4	172	39.4	116	44.6
No	345	49.6	226	51.8	119	45.8
I don't know	50	7.2	25	5.7	25	7.2
No answer	13	1.9	13	3.0	0	0.0
Gender:						
Male	309	44.4	194	44.5	115	44.2
Female	366	52.6	221	50.7	145	55.8
I prefer not to say	10	1.4	10	2.3	0	0.0
No answer	11	1.6	11	2.5	0	0.0
Age:						
Under 25 years	23	3.3	1	0.2	22	8.5
25 to 34 years	63	9.1	16	3.7	47	18.1
35 to 44 years	61	8.8	31	7.1	30	11.5
45 to 54 years	102	14.7	62	14.2	40	15.4
55 to 64 years	148	21.3	100	22.9	48	18.5
65 to 74 years	162	23.3	105	24.1	57	21.9
75 years or over	125	18.0	109	25.0	16	6.2
No answer	12	1.7	12	2.8	0	0.0
Education level:						
Less than 12th grade	4	0.6	2	0.5	2	0.8
High school graduate/GED	74	10.6	33	7.6	41	15.8
Some college	181	26.0	108	24.8	73	28.1
Bachelor's degree	230	33.0	139	31.9	91	35.0
Graduate degree	192	27.6	139	31.9	53	20.4
No answer	15	2.2	15	3.4	0	0.0
Household income (before tax):						
Less than $25,000	53	7.6	23	5.3	30	11.5
$25,000 to $49,999	112	16.1	54	12.4	58	22.3
$50,000 to $99,999	239	34.3	145	33.3	94	36.2
$100,000 to $199,999	188	27.0	115	26.4	73	28.1
$200,000 or more	58	8.3	53	12.2	5	1.9

No answer	46	6.6	46	10.6	0	0.0

[a] On average, mail-based respondents had lived in Palm Beach County for a longer duration (median of 21 – 30 years) than Qualtrics respondents (median of 11 – 20 years; $\chi^2_{df=1} = 10.746$, p value = 0.001). The distribution of responses was also different across the mail-based and Qualtrics samples (z = 3.679, p value = 0.0002).

Prior to presenting respondents with the SPCE questions, we asked them to indicate how important each of the attributes of the Natural Areas Program were to them. The median response was 'extremely' important for native habitat and flood protection, and 'very' important for outdoor recreation (see Table A3 in the Appendix).

A total of 208 respondents (29.9%) voted for either the 1991 or 1999 bond that was used to finance the Natural Areas Program. A further 234 respondents did not vote for either bond (87 respondents, 12.5%) or did not know if they had voted for these bonds (147 respondents, 21.1%). The remaining respondents were not registered as a voter in Palm Beach County at the time of the bond referenda.

Responses to the SPCE questions

Across the SPCE questions the majority of respondents stated that one of the three programs provided ecosystem services that were important to them, and that they would vote in favor of an annual tax to maintain the ecological integrity and services provided by the Natural Areas Program. Between 12.6% and 21.8% of respondents stated that they would not vote to maintain the Natural Areas Program, as presented by each of the choice experiments. The two most common reasons respondents gave for voting not to maintain the natural areas were that: 1) they 'should not have to pay more taxes' (90 respondents, 12.9%); and they 'do not trust the government to run the Natural Areas Program' (48 respondents, 6.9%). Fewer respondents stated that they would not pay to maintain the Natural Areas Program because: it was not their responsibility to pay for the program (24 respondents, 3.4%); the costs of the program were too high (23 respondents, 3.3%); they were not planning to stay in Palm Beach County (7 respondents, 1%); or protecting natural areas was not important to them (6 respondents, 0.9%).

Finally, the majority of respondents (470 respondents, 67.5%) agreed that their responses to the SPCE questions accurately reflected their preferences for the Natural Areas Program. Only 35 respondents (5%) disagreed that their responses to the SPCE questions were an accurate reflection of their preferences.

The coefficients for the MNL model were all significant at the five percent level (Table 3). Respondents positively valued forest and wetlands relative to scrub, dirt and paved trails relative to kayak ramps, and reductions in flood risk relative to no reduction in flood risk. The negative sign on the payment coefficient indicated that respondents derived less utility from profiles with a higher annual tax, which is consistent with economic theory. The opt-out dummy should be interpreted as an alternative specific constant (ASC). This ASC captures the value to respondents of all other attributes not in the choice experiment or choice scenario. *Ceteris paribus*, the negative coefficient on the opt-out dummy indicated that respondents' utility would decrease if natural areas became degraded.

Both the RPL and LCM specifications showed heterogeneity of preferences – an important consideration if a referendum were held to determine whether residents of Palm Beach County would vote in favor of financing continued maintenance of the Natural Areas Program. The significance of the estimated standard deviations for the parameters included in the RPL specification demonstrated heterogeneity of preferences across respondents for the different attribute levels (that were not used as the baseline), with the exception of a 1% reduction in flood risk (Table 3). The positive mean coefficients for forest and wetlands, paved trails, and a 1% or 2% reduction in flood risk suggest that, on average, respondents positively valued these attribute levels (relative to the baseline levels). However, the relative magnitudes of the parameter

Table 3: Multinomial logit and random parameters logit estimates

	Multinomial Logit		Random Parameters Logit			
			Mean		Standard Deviation	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Opt out dummy	-1.530***	0.051	-512.282***	64.845	591.689***	76.220
Protected habitat:						
Forest	0.200***	0.032	11.204***	3.016	25.581***	4.117
Wetland	0.263***	0.032	16.499***	3.282	35.623***	4.556
Recreation opportunity:						
Dirt trails	0.121***	0.032	3.741	3.202	39.945***	4.877
Paved trails	0.254***	0.031	15.799***	2.961	31.891***	4.156
Flood risk:						
1% reduction	0.069**	0.031	5.399**	2.431	4.103	3.919
2% reduction	0.234***	0.031	15.241***	2.794	21.765***	4.620
Annual tax ($)	-0.013***	0.001	-4.190***	0.080	0.397***	0.111
Log likelihood	-5,583.24		-2,734.92			
Observations	10,336		10,336			
Wald χ^2	2,470.44		3,401.79			

** significance at 5% level; *** significance at 1% level.

standard deviations demonstrated that a subset of respondents negatively valued each of these attribute levels (with the exception of a 1% reduction in flood risk; but including dirt trails for which the mean coefficient was not significantly different from zero). Across respondents an increase in the annual payment required to maintain the Natural Areas Program decreased the utility they derived from the program – which was consistent with the MNL specification. Given that the mean value for the opt-out dummy was both statistically significant and negative, respondents positively valued continued efforts to maintain the ecological integrity and amenities of the natural areas, *ceteris paribus*. Based on the RPL specification, respondents' mean willingness to pay (WTP) to maintain the Natural Areas Program (with the baseline attribute levels) was US$122.25 per year (Table 5; estimated in WTP space).

While the RPL model confirmed heterogeneity of preferences, we wanted to further analyze and understand this heterogeneity. As noted by Boxall and Adamowicz (2002), the RPL specification does not explain sources of heterogeneity. Accordingly, we estimated a LCM specification to identify determinants of preference heterogeneity (Table 4). We found that three segments provided the best fit of the data (measured by the AIC, AIC_c, and BIC) while also ensuring that segments (or class sizes) captured at least 10% of the sample. Segment membership coefficients were normalized to zero for segment 3 to identify the remaining coefficients. Segment 1 contained the majority of respondents (49.9% of the sample), while segment 2 contained 32.5% of the sample, and segment 3 contained the remaining 17.6% of the sample.

The LCM model confirmed the RPL finding of preference heterogeneity. According to the LCM specification, preference heterogeneity was correlated with respondents' gender, age,

Table 4: Latent class model

	Segment 1		Segment 2		Segment 3	
	Coeff.	S.E.	Coeff.	S.E.	Coeff.	S.E.
Opt out dummy	-3.461***	0.300	-3.772***	0.466	0.502	0.624
Protected habitat:						
Forest	0.186***	0.047	0.022	0.096	0.071	0.303
Wetland	-0.166*	0.086	0.698***	0.218	0.475	0.350
Recreation opportunity:						
Dirt trails	0.085*	0.051	0.080	0.072	0.364	0.338
Paved trails	0.184***	0.053	0.182**	0.073	0.785***	0.249
Flood risk:						
1% reduction	-0.135**	0.068	0.552**	0.221	0.204	0.314
2% reduction	-0.101	0.091	0.910***	0.277	0.026	2.64
Annual tax ($)	-0.014***	0.002	-0.009**	0.004	-0.077***	0.022
Segment function:						
Constant	0.655***	0.239	-0.257	0.349		
Male[a]	-0.133	0.259	-0.629**	0.298		
44 years old or less[b]	0.891***	0.337	0.392	0.444		
College graduate[c]	-0.105	0.258	0.091	0.311		
Income: ≥$100,000[d]	1.203***	0.321	1.686***	0.347		
Pay flood insurance[e]	0.153	0.275	1.042***	0.307		
Class share	49.9%		32.5%		17.6%	
Log likelihood	-2,583.861					

* significance at 10% level; ** significance at 5% level; *** significance at 1% level.
[a] Dummy variable takes a value of 1 if the respondent is male.
[b] Dummy variable takes a value of 1 if the respondent is 44 years old or less.
[c] Dummy variable takes a value of 1 if the respondent has a college degree.
[d] Dummy variable takes a value of 1 if the respondent has an annual income of $100,000 or more.
[e] Dummy variable takes a value of 1 if the respondent pays flood insurance in Palm Beach County.

and income level, as well as whether they paid flood insurance on their residential property.[7] Segment 1 (which contained younger respondents) positively valued the protection of forest habitats relative to scrub and the provision of paved trails relative to kayak ramps. By contrast, Segment 2 (which contained female respondents and respondents who pay flood insurance) positively valued the protection of wetlands relative to scrub, a 1% or 2% reduction in flood risk relative to no reduction in flood risk, and paved trails relative to kayak ramps. Segment 3 (which contains lower income individuals relative to segments 1 and 2) derived no value from the program attributes, with the exception of paved trails relative to kayak ramps. In contrast to the RPL specification, segment 1 negatively valued a reduction in flood risk, relative to no reduction in flood risk.

The opt-out dummy variable was negative and statistically significant for both segments 1 and 2, i.e. 82.4% of respondents positively valued continued maintenance of the Natural Areas Program (with the baseline attribute levels), irrespective of how preference heterogeneity was captured. Segment 1 derived an average of US$245.78 in value per year from maintaining the

[7] In addition to the LCM model presented in this paper, we estimated a second LCM that incorporated respondents' opinions about the ecosystem services offered by the Natural Areas Program (i.e. this model incorporated attitudinal variables), and whether they had voted for either of the bonds that were used to finance the Natural Areas Program. In addition to age, income and whether respondents pay flood insurance, both the importance that respondents placed on the protection of native habitat and whether they had voted in the past to fund the Natural Areas Program were significant determinants of preference heterogeneity. In total, 81.3% of respondents positively valued the maintenance of the natural areas. This LCM specification is available on request.

Table 5: Willingness to pay estimates (USD)

	Random Parameter Logit		Latent Class Model	
	Mean	**95% CI[a]**	**Mean**	**95% CI**
Value of maintaining the Natural Areas Program (WTP with baseline attribute levels):				
	122.25	93.81, 150.69		
Segment 1			245.78	182.93, 348.89
Segment 2			419.34	242.82, 1636.59
Segment 3			-6.55	-39.34, 6.97
Habitat type: forest (WTP relative to scrub)				
	5.35	2.57, 8.12		
Segment 1			13.24	6.97, 20.49
Segment 2			2.40	-39.60, 23.99
Segment 3			0.93	-6.87, 10.28
Habitat type: wetlands (WTP relative to scrub)				
	7.87	4.86, 10.89		
Segment 1			-11.80	-22.17, 0.18
Segment 2			77.55	35.92, 255.01
Segment 3			6.20	-2.46, 20.50
Recreational opportunity: dirt trails (WTP relative to kayak ramps)				
	1.79	-1.21, 4.78		
Segment 1			6.04	-1.29, 14.10
Segment 2			8.93	-9.44, 57.60
Segment 3			4.75	-4.46, 18.94
Recreational opportunity: paved trails (WTP relative to kayak ramps)				
	7.54	4.83, 10.25		
Segment 1			13.10	5.49, 24.14
Segment 2			20.21	2.72, 96.71
Segment 3			10.24	3.75, 25.44
Flood protection: 1% reduction in flood risk (WTP relative to no reduction in flood risk)				
	2.58	0.31, 4.85		
Segment 1			-9.56	-17.41, -0.34
Segment 2			61.38	28.71, 135.56
Segment 3			2.66	-6.05, 12.45
Flood protection: 2% reduction in flood risk (WTP relative to no reduction in flood risk)				
	7.27	4.72, 9.82		
Segment 1			-7.17	-18.41, 6.52
Segment 2			101.18	54.74, 296.47
Segment 3			0.34	-8.21, 7.49

[a] 95% confidence interval for WTP

Significant results are highlighted.

Natural Areas Program, whereas segment 2 derived an average of US$419.34 in value per year from maintaining the Natural Areas Program (Table 5).

DISCUSSION

In order to continue financing the Natural Areas Program, ERM requires a dedicated source of funds for habitat management, maintenance of infrastructure (including recreational infrastructure) and education and outreach. These finances could be secured if residential property taxes are increased by approximately US$15 per year, although an increase in county taxes may be perceived as economically and politically infeasible.[8] Our study was designed to ascertain whether the benefits of maintaining the Natural Areas Program outweighed the costs of maintenance. Importantly, our study was designed to answer a clearly defined policy question that originated from a government agency with an interest in using ecosystem service information in decision-making (see Ruckelshaus et al., 2015; Waite et al., 2015).

In common with other studies that have valued habitat and ecosystem services (e.g., Abildtrup et al., 2013; Birol et al., 2006; Carlsson et al., 2003; Milon & Scrogin, 2006), we found heterogeneity of preferences. We specifically tested for heterogeneity of preferences

[8] As a point of reference, in 2015, 47% of households in Palm Beach County paid over $3,000 in property taxes. A total of 17.2% of households paid $2,000 to $3,000, 9.9% of households paid $1,500 to $2,000, 16.1% of households paid $800 to $1,500 in property taxes, and 8.3% of households paid less than $800 in property taxes. An estimated 2,947 households (1.5% of all households) paid no property tax. Source: https://datausa.io/profile/geo/palm-beach-county-fl/#housing (accessed October 15, 2017)

because this information was important for determining whether there was a clear margin of support for continuing to fund the Natural Areas Program (with specific focus on native habitat, recreational infrastructure, and flood protection) – information that would be important to County commissioners in deciding whether to hold a referendum on financing the Natural Areas Program through a property tax increase. Our objective was also to provide ERM with information on how different groups of residents value the Natural Areas Program, and which program attributes they value, in order to assist ERM with their management decisions for the natural areas. Although we recognized that testing for preference heterogeneity would increase the complexity of the analysis and would require careful explanation in reports, presentations and other outreach efforts, this analysis was necessary to ensure that our results were accurate and relevant to the policy question (Waite et al., 2015).

Our results suggest that the majority of respondents positively valued maintaining the ecological integrity and amenities of the Natural Areas Program (as we defined the program in this study). Even accounting for heterogeneity of preferences, 82.4% of respondents valued the upkeep of the natural areas well above the amount of money that would be required to continue financing maintenance of the program. Degradation of the natural areas would reduce these individuals' welfare. Only 17.6% of respondents did not positively value the upkeep of the natural areas (the op-out dummy was not significantly different from zero), and although they placed positive value on recreational opportunities provided by the program, this value (mean of US$10.24 per year for paved trails relative to kayak ramps) was less than the amount of money required to finance maintenance of the program.

Our study did not focus on a single habitat type or ecosystem service, which may have reduced the likelihood that the valuation would be used in decision-making (Ruckelshaus et al.,

2015; Waite et al., 2015). Using latent class analysis, we found that 49.9% respondents positively valued the conservation of forests by the Natural Areas Program, and 32.5% of respondents placed value on the conservation of wetlands - both relative to scrub. This finding is entirely consistent with the fact that the majority of respondents stated that they would probably or definitely like to live next to a forest, whereas only 42% of respondents stated that they would like to live next to a wetland.[9] Scrub habitat was used as the baseline level for the habitat attribute, and our results suggest that respondents placed least value on securing and maintaining the ecological integrity of scrub habitat. Given that multiple imperiled species rely on this habitat, our findings suggest that the education efforts of ERM should highlight the importance of conserving scrub habitat. Furthermore, ERM may be able to incorporate additional uses of scrub habitat by the public to increase the utility that can be gained from this habitat type.

The LCM models demonstrated that all respondents positively valued paved trails, relative to kayak ramps (which allow for walking, bird watching and nature appreciation). Respondents placed higher value on paved trails than dirt trails (which allow for hiking, running, bicycling, and horseback riding), a finding that was consistent for the LCM models and the RPL model. It is likely that respondents placed higher value on paved trails because they allow for less strenuous outdoor recreation. Given the median ages of respondents, it is unlikely that many

[9] It should be noted that the RPL specification obscured the fact that a larger share of respondents valued forests positively. As such, we would recommend that both RPL and LCM specifications are used to investigate heterogeneity of preferences when investigating how ecosystem services provision and biodiversity conservation affects social and individual welfare. For example, Birol et al. (2006) used both RPL and LCM specifications to investigate heterogeneity of preferences for wetland management.

hike or run, and the majority of respondents never rode horses and only sometimes went bicycling.

Finally, 32.5% of respondents positively valued a 1% or 2% reduction in flood risk, relative to no reduction in flood risk. This result was consistent with the fact that 41.5% of respondents paid flood insurance on their property.

We note that the response rate on the mail-based survey was less than optimal. However, this low response rate is not surprising. Recent work by Don Carlos et al. (2017) confirms declining response rates for traditional survey modes (e.g., telephone and mail-based surveys) to below 20%. Furthermore, the Pew Research Center found that between 1997 and 2016 response rates for telephone surveys declined from 36% to 9% (Keeter et al., 2017). Interestingly, Keeter et al. (2017) concluded that low response rates did not necessarily introduce substantial bias into survey results. To increase the reliability of our results we also collected data using Qualtrics.

CONCLUSIONS

This study demonstrates the value of conducting survey-based analysis, in order to inform government decision-making. The Millennium Ecosystem Assessment highlighted the importance of embedding knowledge about ecosystems (and the value that people derive from ecosystems) into policy design, for example through policy appraisal and political systems (see also Turner et al., 2010; Turnpenny et al., 2014). However, "in spite of individual triumphs, the pace at which the theory of ecosystem service valuation is being incorporated into real decisions has been painstakingly slow, with disappointingly few success stories" (Ruckelshaus et al., 2015: 12; see also Laurans et al., 2013). In analyzing why this might be the case, Laurans et al. (2013) concluded that: "(1) the vast majority of [valuations] are produced in a 'supply-side' logic; (2) it is thus uncertain that the type of tools offered to potential users are the best match for real-

decision-making needs; and (3) [valuation] is primarily geared towards an informative role for general influence and awareness-raising" (Larans et al., 2013: 217).

Our study is demand driven and provides an example of a request from government officials for statistically-defensible valuation of habitat and ecosystem services conservation to inform decision-making. Specifically, ERM requested a valuation of the Natural Areas Program to determine whether they should advise county commissioners to hold a referendum to secure tax-based financing for the program. ERM also wanted to ascertain the value of the Natural Areas Program to better inform the department's decisions on how to manage this green infrastructure. To increase the usefulness of our results to policy-makers, we incorporated preference heterogeneity into our analysis because we recognized that greater accuracy and reliability is required when economic valuation is used in instrument design (Gómez-Baggethun & Barton, 2013).

Based on our results, residents of Palm Beach County positively value the ecological integrity and amenities provided by the Natural Areas Program, and their welfare would be reduced if natural areas became degraded – a finding that is consistent with previous research on urban ecosystem services (e.g. Brander & Koetse, 2011; Gómez-Baggethun & Barton, 2013). Although we found preference heterogeneity for the attributes of the Natural Areas Program, on average respondents valued the upkeep of the natural areas above the amount of money they would be required to pay to maintain the program.

ERM's preference for raising funds through a flat property tax increase was consistent with survey respondents' preferences. For the majority of property owners, US$15 per year would constitute a 0.75% or lower overall increase in their property taxes. Taking preference heterogeneity and demographics into account, our results suggest that Palm Beach County

residents would vote in support of a tax increase to continue financing the Natural Areas Program, and that Palm Beach County should proceed with a referendum. However, we recognize that there may be discrepancies between stated voting intentions, and actual voting outcomes if a referendum were held. Despite using best practices in eliciting and analyzing data, there may be systematic biases in respondents' stated intentions with respect to funding the Natural Areas Program. Changes in explanatory variables may cause people's intentions to shift over time. For example, unanticipated changes in income may alter people's intentions to fund natural areas. Finally, there may be imperfect correlation between intentions and actions (Sun & Morwitz, 2010). Whether voters would support an increase in property taxes (or other funding efforts) to finance continued maintenance of Palm Beach County's natural areas remains to be seen.

Funding: Funding for this research was provided by Palm Beach County Department of Environmental Resources Management (Project No. 2017ERM01).

This research was approved by the University of Florida Institutional Review Board (IRB201700666).

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Appendix

Table A1: Would you like to live next to these different types of habitat?

	Median	Percent of respondents					
		Definitely no	Probably no	Undecided	Probably yes	Definitely yes	No answer
Forest	4[a]	10.2	10.9	10.2	29.6	36.4	2.7
Wetlands	3[b]	19.3	19.5	14.9	20.1	22.0	4.2
Scrub	3[c]	16.5	21.7	17.1	19.3	21.0	4.5

'Definitely no' = 1; 'probably no' = 2; 'undecided' = 3; 'probably yes' = 4; 'definitely yes' = 5

[a] On average, mail-based respondents placed higher preference on living next to forest (mean response of 3.92) than Qualtrics respondents (mean response of 3.43; t = 4.723, p value = 0.000). The distribution of responses was also different across the mail-based and Qualtrics samples (z = 5.364, p value = 0.000).

[b] On average, mail-based respondents placed higher preference on living next to wetlands (mean response of 3.27) than Qualtrics respondents (mean response of 2.75; t = 4.584, p value = 0.000). The distribution of responses was also different across the mail-based and Qualtrics samples (z = 4.610, p value = 0.000).

[c] On average, mail-based respondents placed higher preference on living next to scrub (mean response of 3.33) than Qualtrics respondents (mean response of 2.66; t = 6.119, p value = 0.000). The distribution of responses was also different across the mail-based and Qualtrics samples (z = 5.981, p value = 0.000).

Table A2: On average, how often do you, or members of your household, engage in outdoor recreation?

	Median	Percent of respondents					
		Never	Sometimes	Every month	Every week	Daily	No answer
Hiking/walking	3[a]	9.8	33.3	11.8	20.4	21.4	3.3
Kayaking/canoeing	1	51.7	29.3	7.2	2.3	0.3	9.2
Bicycling	2	32.5	30.7	10.8	13.5	4.6	7.9
Riding horses	1[b]	73.9	13.1	1.0	1.0	1.3	9.8
Fishing	1	46.8	30.7	7.9	5.3	1.3	7.9
Bird watching	2[c]	35.1	31.9	7.8	7.6	11.2	6.5
Other[d]	2	7.5	4.6	1.7	4.2	2.4	79.6

'Never' = 1; 'sometimes' = 2; 'every month' = 3; 'every week' = 4; 'daily' = 5

[a] On average, mail-based respondents hiked/walked more frequently (mean response of 3.31) than Qualtrics respondents (mean of 2.78; t = 5.021, p value = 0.000). The distribution of responses was also different across the mail-based and Qualtrics samples (z = 4.899, p value = 0.0000).

[b] On average, mail-based respondents rode horses less frequently (mean response of 1.21) than Qualtrics respondents (mean of 1.33; t = -2.326, p value = 0.0204). The distribution of responses was also different across the mail-based and Qualtrics samples (z = -2.728, p value = 0.0064).

[c] On average, mail-based respondents went bird watching more frequently (mean response of 2.38) than Qualtrics respondents (mean of 2.00; t = 3.544, p value = 0.0004). The distribution of responses was also different across the mail-based and Qualtrics samples (z = 3.606, p value = 0.0003).

[d] Examples of other recreational activities: paddle boarding; running; swimming; spending time on the beach; outdoor photography; and nature watching

Table A3: How important are the attributes described in this survey to you?

	Median	Percent of respondents					
		Not at all	Slightly	Moderately	Very	Extremely	No answer
Native habitat	5[a]	1.9	4.3	12.1	25.0	55.3	1.4
Outdoor recreation	4[b]	2.2	5.3	17.1	32.0	42.0	1.4
Flood protection	5[c]	1.7	4.2	13.5	27.3	52.0	1.3

'Not at all' = 1; 'slightly' = 2; 'moderately' = 3; 'very' = 4; 'extremely' = 5

[a] On average, mail-based respondents placed higher importance on native habitat (mean response of 4.48) than Qualtrics respondents (mean of 3.98; t = 6.747, p value = 0.000). The distribution of responses was also different across the mail-based and Qualtrics samples (z = 6.980, p value = 0.000).

[b] On average, mail-based respondents placed higher importance on outdoor recreation (mean response of 4.28) than Qualtrics respondents (mean of 3.76; t = 6.872, p value = 0.000). The distribution of responses was also different across the mail-based and Qualtrics samples (z = 7.004, p value = 0.000).

[c] On average, mail-based respondents placed higher importance on flood protection (mean response of 4.47) than Qualtrics respondents (mean of 3.90; t = 7.818, p value = 0.000). The distribution of responses was also different across the mail-based and Qualtrics samples (z = 7.957, p value = 0.000).