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Research article

Value orientation and payment for ecosystem services: Perceived detrimental consequences lead to willingness-to-pay for ecosystem services

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ABSTRACT

This research analyzed whether the three distinct value orientations posited under the Value-Belief-Norm (VBN) model determine willingness-to-pay (WTP) for a payment for ecosystem services (PES) program. A survey instrument gathered U.S. residents' knowledge and attitudes toward ecosystem services and PES, and elicited WTP for the restoration of a hypothetical degraded forest watershed for improved ecosystem services. Data from over 1000 respondents nationwide were analyzed using exploratory factor analysis (EFA) and ordered logistic regression. Urban respondents were more familiar with the concepts of ecosystem service and PES than rural respondents but familiarity did not yield statistically different WTP estimates. Based on results from the EFA, we posit that latent value orientations might be distinguished as 'detrimental', 'biospheric' and 'beneficial (egoistic)' – as compared to 'altruistic', 'biospheric' and 'egoistic' as suggested in the VBN's general awareness of consequences scale. Awareness of biospheric and detrimental consequences along with ascriptions to personal norms had positive and significant effects on stated WTP. Beneficial (egoistic) value orientation was negatively associated with WTP and carried a negative average WTP per household per year (US$ -30.48) for the proposed PES restoration program as compared with biospheric (US$ 15.53) and detrimental (US$ 3.96) orientations. Besides personal norms, awareness of detrimental consequences to human wellbeing from environmental degradation seems the stronger driver of WTP for the restoration and protection of forest watershed ecosystem services under a PES program.

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1. Introduction

Forest ecosystems provide tangible and intangible benefits that sustain human well-being (Millennium Ecosystem Assessment, 2005). While tangible benefits (e.g. timber, game and fruits) are traded with observable price and value signals, intangible benefits (e.g. wildlife habitat, water filtration, and carbon sequestration) typically lack pricing from traditional market transactions (Baranzini et al., 2010; Chiabai et al., 2011; Duncker et al., 2012; Kosoy and Corbera, 2010). As a consequence of their non-excludable and non-rival (quasi) public good characteristics, intangible non-market forest ecosystem services are often underprovided as forests are managed to maximize profits from marketable products (Muradian et al., 2010; Roesch-McNally and Rabotyagov, 2016). A lack of financial incentives to land owners to internalize benefits associated with non-market benefits, along with explicit and implicit policy programs that favor the supply of market goods, have contributed to the detrition in the flow and quality of forest ecosystem services (Arriagada and Perrings, 2009; Bond et al., 2009; Obeng and Aguilar, 2015; Pearce, 2001).

Public policy strategies have been devised to focus on healthy forest ecosystems capable of providing both market and non-market benefits to society. Specifically, payments for ecosystem service (PES) programs have emerged to offer financial incentives to land managers in exchange for specific practices poised to maintain or enhance a range of non-market forest ecosystem services (Pagiola, 2008). PES is defined as a market-based approach where providers of ecosystem services are compensated by those who benefit from the services they manage, hence, increasing their

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incentive to conserve them (Daily and Matson, 2008; Engel et al., 2008; Pagiola, 2008; Robertson and Wunder, 2005; Wunder and Alban, 2008). Effective PES-based incentives should offset the opportunity cost of maintaining management practices capable of supporting positive environmental externalities. As PES programs continue to expand, there is a need to understand the public's awareness, attitudes toward, and willingness to engage in such programs (López-Mosquera and Sánchez, 2012). More specifically, there is the need to better understand factors behind willingness-to-pay (WTP) for forest ecosystem services to assure the financial feasibility of PES programs.

A multi-disciplinary approach that encompasses cultural, socio-economic and psycho-social dimensions is needed to understand underlying factors behind WTP for a PES program (Muradian et al., 2010; Smith et al., 2013). As a type of pro-environmental behavior, willingness to participate and pay for a PES program has been examined as a function of socio-demographic characteristics (e.g. age, gender, income, education) and psycho-social variables (values, beliefs, moral norms and attitudes) (Clark et al., 2003; De Groot and Steg, 2008; Kang et al., 2012; Kotchen and Reiling, 2000; López-Mosquera and Sánchez, 2012; Spash and Hanley, 1995; Spash et al., 2009). Socio-demographic variables including age, income, education, and marital status have been noted to explain only modest levels of variance in individual's environmental behavioral decisions (Sauer and Fischer, 2010). Conversely, attitudinal and ethical variables have not been frequently employed to explain heterogeneity in WTP estimates compared to socio-economic variables (Ojea and Loureiro, 2007). There is limited empirical research offering an integrated perspective to better understand and predict WTP for non-market forest ecosystem services in the context of PES programs.

One of the most popular approaches to understanding behavioral constructs is the value-belief-norm (VBN) model proposed by Stern et al. (1999). The VBN model is based on the premise that an individual's behavior towards the environment is influenced by values, beliefs and moral norms. Under the VBN model three distinct value orientations (biospheric, egoistic and altruistic) define an individual's general awareness of consequences (GAC) to nature, self and other people. These value orientations together with ascriptions to personal norms and perceived ability to reduce environmental threats offer a framework to examine environment-related behavioral intentions reflecting individuals' WTP decisions (Fielding et al., 2008; Hansla et al., 2008; López-Mosquera and Sánchez, 2012; Menzel and Bögeholz, 2010; Oreg and Katz-Gerro, 2006; Spash, 1997, 2006; Stern et al., 1995). To date, the PES literature has largely omitted discussions on whether individuals would be willing to pay to support a PES program for forest ecosystem conservation to ensure continuous provision of services for themselves or others. Moreover, the literature seems devoid of assessments linking attitudes and value orientations along socio-demographic characteristics in a single model explaining WTP for PES initiatives.

This study applied the VBN model to examine WTP for a hypothetical PES program designed to restore a degraded forest watershed ecosystem. A stated preference survey was implemented to examine how attitudes, values and norms influenced WTP for PES restoration programs in the U.S. Furthermore, we compared levels of familiarity and attitudes toward non-market forest ecosystem services, PES program participation and WTP levels between urban and rural residents to examine differences related to knowledge, socio-cultural and ecosystem proximity effects (Garber-Yonts et al., 2004). WTP values were elicited for a geographically-distant ecosystem to prevent direct use of the resource but from which corresponding ecosystem services could still contribute to respondents' wellbeing (Newton et al., 2016). Empirically, a PES program to restore an out-of-state forest watershed in the U.S. was selected as households might be dependent on ecosystems services irrespective of geographic proximity. Moreover, the WTP choice was instrumentalized to examine whether egoistic motivations would still be major drivers behind stated pro-environmental behavior even though the degraded ecosystem may not pose a direct threat to their wellbeing (Schwartz, 1992; Hansla et al., 2008). Individuals may be willing to pay based on self-centered grounds and expect others to derive direct benefits regardless of whether they pay or not in order to conserve an ecosystem driven by egoistic and altruistic values. Others may also be willing to pay to support a program restoring distantly-occurring ecosystem services motivated by biospheric existence[1] or future option values.

2. Aim and objectives

This study aimed to better understand how values, beliefs and norms, in addition to selected knowledge and socio-demographic variables, influence WTP for a PES program in the U.S. Three specific objectives guided this research. The first objective was to identify the level of knowledge and attitudes toward the concepts “ecosystem services” and “PES” among U.S. residents and determine differences between urban and rural populations. The second objective was to validate whether the GAC scale would discern three value orientations (biospheric, egoistic and altruistic) based on the analysis of respondents' environmental attitudes. The third objective was to quantify the effects of VBN variables and socio-demographic descriptors on WTP for a hypothetical PES program to restore a forest watershed.

3. Theoretical framework

The VBN proposes that biospheric, egoistic and altruistic orientations influence environmental perceptions, behavior and how individuals formulate and structure environmental attitudes and beliefs. Environmental attitudes that emerge out of actions taken to avoid consequences over nature are classified as a biospheric orientation; actions taken because of beliefs of consequences incurred on oneself encompass an egoistic orientation; an altruistic orientation emerges if actions are motivated by concern of consequences on others (Stern et al., 1993, 1995; Stern, 2000; Spash, 2006; Ojea and Loureiro, 2007; De Groot and Steg, 2008; Ryan and Spash, 2012). In the VBN model, each value orientation predisposes individuals to be concerned about consequences of their behavior on things they value. An individual is thus assumed to be more receptive to certain information depending upon her particular value orientation that in turn, influences beliefs and ultimately behavior (Ryan and Spash, 2010).

People who believe that an environmental condition has adverse consequences for the things they value will be predisposed to take action to improve or remove the existing threat (Stern et al., 1993). Environmental consequences have been articulated in two attitudinal scales namely, “Awareness of Consequences (AC)” and “Environmental Concerns (EC)”. Both scales focus on the underlying factors of concern for the environment and the influence of environmental consequences on one's self, other people, and nature (Stern et al., 1993; Weigel and Weigel, 1978). In the VBN model, the AC scale has been integrated and generalized around the EC scale to form the GAC scale (Stern et al., 1993). In this study we applied the

[1] Existence value may be defined as an individual's economic value from simply knowing that a particular ecosystem or natural environment exists, independently of her use (Krutilla, 1967).

GAC scale that expresses the three underlying factors of egoistic, biospheric and altruistic value orientations based on individual's attitudes toward environmental issues. Integration of these variables in our WTP model offers insights into latent use and non-use ecosystem services motivations (McConnell, 1997; Randall and Stoll, 1983).

Fig. 1 depicts the conceptual framework of the study based on the VBN model. Following Ryan and Spash (2010), a person's moral obligation to financially support a PES program to reduce the threat associated with a degraded forest watershed ecosystem would be influenced by: (i) the individual's general awareness of consequences of potential future ecosystem state, (ii) the perceived ability to reduce the threat, and (iii) the individual's ascription of responsibility to act.

3.1. WTP model specification

Stated preferences reveal behavioral intention which in this case was captured through stated WTP (Barro et al., 1996; Bateman et al., 2002; Stern et al., 1993). WTP was modeled as a function of value orientations as:

$$WTP_i = f\left(Y_i^*\right) = X_i\beta + \varepsilon, \quad (1)$$

where WTP is an individual's behavioral intention that is a function of a continuous latent variable (Y_i^*.), determined by X_i as a vector of individual characteristics, β. are the parameters tbe estimated and ε_i. is a random error term. Y_i^*. cannot be observed directly, but WTP levels were elicited through an ordinal 1 to 5 scale (1 = Definitely not pay this amount, 2 = Probably not pay this amount, = Probably pay this amount, 4 = Very likely pay this amount, 5 = Definitely pay this amount) for selected annual PES cost levels. Thus we have:

$$WTP_i = j \text{ if } k_{j-1} < Y_i^* < k_j \text{ for } j = 1, \ldots, 5; \quad (2)$$

where j is the ordinal response with categories (j = 5) and k_j. indicates cut-points to be estimated (Ercolano et al., 2012; Greene and Hensher, 2010; Haghjou et al., 2013). The probability of possible WTP outcomes is therefore given as:

$$\text{Prob}[WTP_i = j|x] = F(k_j - X_i\beta) - F(k_{j-1} - X_i\beta), \quad (3)$$

that assumes that $\kappa_0 = -\infty$ and $\kappa_j = +\infty$ and F is the cumulative distribution function f the error term.

WTP responses were analyzed using an ordered logistic regression estimated using maximum likelihood. An ordered regression model enabled us to examine the predictive power of the explanatory variables on WTP. This model applies to data meeting the proportional odds assumption which specifies that the effects of the independent variables do not vary by the level of the dependent variable (Ercolano et al., 2012; Long and Freese, 2006). Explanatory variables were selected based on the integrated perspectives of VBN attributes and reported importance of attitudinal and socio-demographic factors influencing WTP for environmental improvements (e.g. Calderon et al., 2012; Kreye and Adam, 2014; López-Mosquera and Sánchez, 2012; Ojea and Loureiro, 2007; Rai and Beck, 2015; Spash, 2006; Stern et al., 1993; Sulo et al., 2012).

4. Methods

4.1. Survey development

A survey with four sections was developed following Dillman et al. (2009), Mitchell and Carson (1989) and Pascual et al. (2010). In the first section we collected information on respondents' general knowledge of, and attitudes toward, the concepts of ecosystems, ecosystem services, non-market ecosystem services and forest ecosystem services. Section two gathered respondents' attitudes toward PES as a forest conservation tool and their value orientations. Attitudinal questions were preceded by a detailed description of what the concept of PES entailed. It was followed in Section three that included a set of stated preference questions assessing WTP for the restoration of a hypothetical degraded forest watershed. The questionnaire concluded with questions asking socio-demographic information. The first three sections of the questionnaire included pictorial illustrations for better visualization and to reduce potential response bias (García-Llorente et al., 2012; Houtven et al., 2014).

The GAC environmental attitudinal scale was used within Section 2 to assess the distinct value orientations posited in the VBN model. Following a comprehensive literature review including Gärling et al. (2003), López-Mosquera and Sánchez (2012), Ojea and Loureiro (2007), Rai and Beck (2015), Ryan and Spash (2010), Snelgar (2006), Spash (2006), Stern (2000) and Stern et al. (1993), we selected three attitudinal statements each to measure biospheric, egoistic, and altruistic value orientations. Furthermore, we included one additional statement modified from Clark et al. (2003) and López-Mosquera and Sánchez (2012) to measure personal norms, an attribute of the VBN model. Level of agreement with all statements in the GAC scale and personal norms were assessed on a five-point Likert scale (1 = Strongly disagree, 3 = Neither agree nor disagree, 5 = Strongly agree).

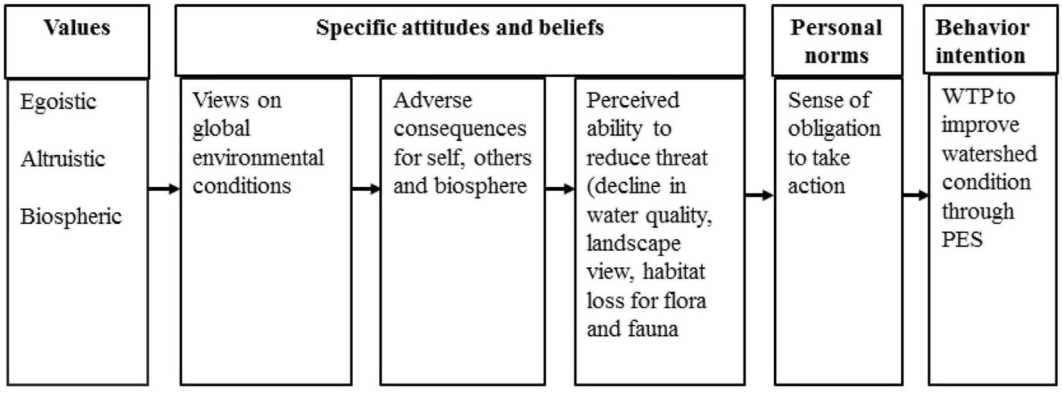

Fig. 1. Conceptual framework based on the VBN model.
Source: Adapted and modified from Ryan and Spash (2010).

Following established guidelines for stated preference studies (Mitchell and Carson, 1989; Pascual et al., 2010) WTP elicitation included: (i) a detailed pictorial description of the resource to be valued, (ii) a hypothetical description of current and alternative management conditions with a PES program and (iii) the form and frequency of payment (annual increase in income tax for five years). The hypothetical PES outcomes for an out-of-state 1000 mile^2 forest watershed were: *current condition* denoting a degraded and poor functioning watershed ecosystem capable of low provision of ecosystem services expected to decline if no action is taken; *conditions with PES program* denoting a restored watershed ecosystem capable of providing three key bundled ecosystem services. Specific ecosystem services were improved water quality through reduction of excess nutrients contamination and other sources of pollution, improved habitat for threatened native plant and animal species, and enhanced watershed landscape beauty. Respondents' WTP were recorded on an ordinal scale: 1 = Definitely not pay this amount, 3 = Probably pay this amount, 5 = Definitely pay this amount. Pre-defined WTP (US$ household^{-1} year^{-1}) levels were 30.00, 60.00, 90.00, 120.00 and 150.00. As recommended by Duffield and Patterson (1991) and Wu (1991), we first obtained a preliminary range of WTP values through an open-ended format during an initial pretest. Final WTP levels were selected after pretests and validated based on past studies eliciting WTP for improved water quality, forest habitat and landscapes values (Azevedo et al., 2001; De Zoysa, 1995; Hjerpe et al., 2015; Houtven et al., 2014; Roesch-McNally and Rabotyagov, 2016). In order to reduce elicitation bias, respondents were reminded to consider their spending limitations and the financial implication their WTP will have on their income.

The survey was pre-tested twice with residents of Columbia, Missouri, to improve the final questionnaire. A third pre-test was conducted using random online participants recruited by the web-based marketing intelligence firm Survey Sampling International (SSI).

4.2. Data collection

Surveys were launched online through SSI to collect a sample of 1200 U.S. residents, 18 years of age or older. SSI maintains a pool of over 7 million resident online panelists in the U.S. A web-based survey was chosen due to time and cost effectiveness, reduced error and reported comparability with mail, face-to-face or phone-based surveys (Aguilar and Cai, 2010; Buchanan and Hvizdak, 2009; Dolnicar et al., 2009; Evans and Mathur, 2005; Manfreda and Vehovar, 2002; Mertler, 2002). Our sample size to represent the U.S. population was estimated following Krejcie and Morgan (1970) and conforms to comparable studies using online panelists that range from 1000 to 1500 respondents (e.g. Aguilar and Cai, 2010; Jensen et al., 2010; Meldrum, 2015; Presnall et al., 2015). Data collection was conducted in the month of April 2016. Only one complete survey per participant was allowed and data collection was stopped once the target number of complete responses was achieved. All data collection protocols were approved by the University of Missouri Institutional Review Board.

4.3. Data analysis

Test-statistics for significant differences in proportions and means were performed on levels of familiarity with concepts of ecosystems and ecosystem services, awareness and knowledge of PES, attitudinal statement toward PES and importance of non-market forest ecosystem services. These explored differences between urban and rural respondents.

Data on value orientations and WTP were analyzed following a four-step approach. First, the GAC scale items were reduced using principal axis exploratory factor analysis (EFA) to identify latent value orientations and validate those of the VBN (Ryan and Spash, 2012). The EFA was preceded by internal consistency and reliability tests to examine the GAC scale items using Cronbach's coefficient alpha, item-rest correlation, and Kaiser-Meyer-Olkin (KMO) (López-Mosquera and Sánchez, 2012; Paudyal et al., 2015). Cronbach's alpha coefficient greater than 0.7 provides an acceptable level of internal consistency and reliability among items being used to measure the respective latent factors (Cronbach and Shavelson, 2004; George and Mallery, 2003). The range of KMO values are interpreted as follows: 0.90 to 1.00 = outstanding; 0.80 to 0.89 = meritorious; 0.70 to 0.79 = middling; 0.60 to 0.69 = mediocre; 0.50 to 0.59 = miserable; 0.00 to 0.49 = don't factor (Dziuban and Shirkey, 1974). Factor loadings were obtained after varimax rotation (Ryan and Spash, 2012). The second step involved calculating indices of mean score values for the latent value orientations obtained from the EFA. In the third step, three different econometric models were estimated using ordinal logistic regression models. Model 1 included VBN attributes-only variables, Model 2 included additional socio-demographic and attitudinal variables and Model 3 controlled for all attitudinal and socio-demographic variables by including interaction variables. Interaction variables allowed us to measure the combined effects of demographic factors and value orientations on WTP decisions and controlled for heterogeneity among respondents' WTP decisions (Aguilar and Cai, 2010). A test for proportional odds assumption was conducted. The goodness of fit of all models were given by Log-likelihood estimates, McFadden's pseudo R^2, and Nagelkerke R^2 for non-linear models. The final step calculated WTP estimates. We compared differences in WTP monetary estimates among the latent value orientations using the "grand constant" formulae (Giraud et al., 1999). Coefficients were multiplied by their respective variable mean, then summing over all coefficients (excluding the cost variable) and dividing by the coefficient of the cost variable (Eq. (4)):

$$\text{Mean WTP} = \frac{\widehat{\beta}_0 + \sum_{j=5}^{25}\left(\widehat{\beta}_j \overline{x}_i\right)}{\widehat{\beta}_1} \quad (4)$$

Confidence intervals were computed using parametric bootstrapping (Hole, 2007). Following Ojea and Loureiro (2007), the mean WTP for each value orientation was compared with estimates obtained from the entire sample. All analyses were conducted using Stata version 12.1.

5. Results

Surveys were screened for completeness which resulted in 1002 usable surveys. Sample statistics were comparable to demographics reported by the U.S. Census Bureau (2015). Female respondents and those with at least a college degree or higher education level comprised 52.1% and 49.3% of the sample, respectively. The U.S. Census Bureau (2015) reports 50.9% female population and 58.2% with at least some college or post high school training or higher. A majority (81.4%) of respondents reported living in urban areas compared to rural dwellings. This is comparable to the 80.7% of the U.S. population living in urban and urban clustered areas (Census Bureau, 2015). Urban respondents reported higher education levels (respondents with college degree = 54.3%) than rural respondents (respondents with college degree = 27.4%). Since the minimum age limit for respondents in our survey was 18 years old, we compared our age distribution with an adjusted population census data (U.S. Census Bureau, 2013) by excluding those under 18

from the census age data. More than half (52.1%) of respondents were 45 or older which is comparable with the U.S. population (52.6% above 44 years old). Regarding total annual household income, 32.1% of the respondents reported an annual household income of less than $30,000. The U.S. Census Bureau (2015) reports 28.62% of the population has a gross annual household income of less than $30,000. Less than half of respondents (urban = 17.9%; rural = 13.4%) reported an affiliation or provision of financial support to environmental conservation or forestry related groups.

5.1. Awareness and attitudes towards ecosystem services and PES concepts

Fig. 2 shows reported means for level of familiarity with the concepts of ecosystem, ecosystem services and non-market ecosystem services. All three concepts' average values were lower than 4 which suggest levels below "very familiar". In general, respondents weren't too familiar with the concepts of "ecosystem services" (mean = 3.00), or "non-market ecosystem services" (mean = 2.68) compared to "ecosystem" with a mean of 3.25 which denoted slight familiarity. Urban respondents were significantly more familiar with all three concepts than rural counterparts (p-value < 0.001).

Fig. 3 presents respondents' level of awareness and knowledge of PES. Average level of awareness and knowledge about PES was relatively low (mean value = 1.84 on 5-point scale). Some 56.0% of respondents indicated they have never heard about PES, nearly twice as many as respondents who reportedly had moderate to extreme knowledge (26.7%). A low level of awareness was found among both rural and urban respondents. However, urban respondents (27.6%) were more familiar (moderate to extreme knowledge) about what a PES program entailed than rural respondents (22.6%) but the test on equality proportions reported a statistically insignificant difference (p-value = 0.16).

Table 1 presents the mean and standard deviations of self-reported attitudes toward selected non-market forests ecosystem services. Respondents were more assertive of the important role forests play in providing non-market ecosystem services with all average levels of awareness and knowledge greater than 4. Forests' role in maintaining clean air quality and regulation of temperature received the highest mean importance rating (4.34). The least important non-market service was providing sacred places that carry spiritual and historic values (3.78). In terms of service classification, supporting (habitat) services received the highest level of importance to respondents (mean value 4.32), followed by regulation services (mean value 4.29), and lastly cultural services (mean value 4.02). However it is important to mention that "Habitat service" was rated with only one service statement while regulation and cultural services were rated based on the average of the number of service statements assessed.

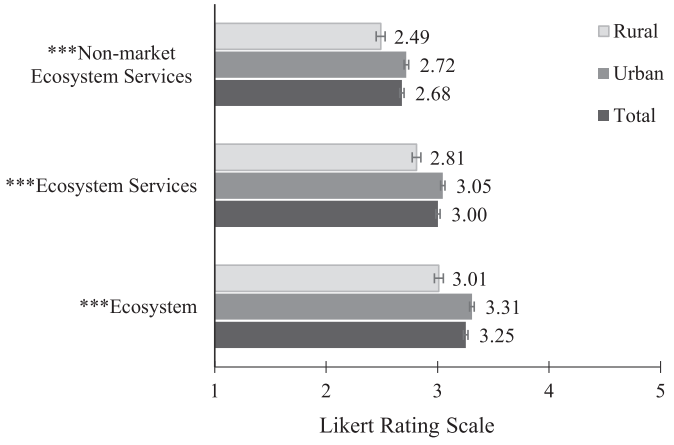

Fig. 2. Respondents' level of familiarity with concepts of ecosystems and services assessed on a 5-point Likert scale (1 = Not at all familiar, 3 = Slightly familiar, 5 = Extremely familiar). *** Statistically significant differences in means (p-value < 0.001).

Average responses to four attitudinal statements regarding the concept of PES as a forest conservation tool were greater than 3 which suggests a moderate level of agreement (Fig. 4). About 64.0% and 66.0% of respondents in urban and rural areas, respectively, agreed or strongly agreed to the statement "paying landowners to protect and manage forests for ecosystem services through PES program is desirable" (total sample mean = 3.76). Nearly half of respondents (46.2%) in urban areas, compared to 36.6% in rural areas, agreed or strongly agreed that PES is not a desirable concept as incentives to landowners may not guarantee good continuous land management practices to ensure ecosystem services provision (mean value = 3.40). Protest and social pressure statements, "it is my right to have a well preserved forests and I should not have to pay extra for it through mechanisms such us PES" and "Most people who are important to me (for example: family members, friends) would expect me to participate in a PES program and pay to protect forests" had mean scores of 3.50 and 3.17, respectively. Differences between urban and rural respondents' levels of agreement to all the statements were statistically significant (p-value < 0.01) except for "paying landowners to protect and manage forests for ecosystem services through PES program is desirable" (p-value = 0.82).

5.2. GAC scale and exploratory factor analysis

Table 2 shows responses to selected GAC attitudinal statements and corresponding distributions. It is noticeable how a majority of responses denoted at least agreement with all statements with the exception of "Claims that current levels of environmental pollution are changing the Earth's climate are exaggerated" that were more evenly distributed. Constructs in the GAC scale had reasonably high internal consistency (Cronbach's alpha coefficients > 0.80 and an overall Cronbach's alpha coefficient = 0.85). The overall KMO measure of sampling adequacy was 0.91 providing evidence that the GAC items can be grouped into smaller sets of underlying factors (Ryan and Spash, 2012). Please see Appendix 1 for more details.

Results of varimax rotated latent factors and EFA loadings are presented in Table 3. For comparison, factor loadings obtained by Spash (2006) and Ojea and Loureiro (2007) are also reported. The first latent factor was dominated by egoistic orientations (all GAC-ego constructs) with traits of biospheric (GAC_bio3) and altruistic values (GAC_alt2). We termed this latent factor "*Beneficial (egoistic)*" consequences as opposed to "egoistic" because it points to environmental protection outcomes with positive consequences on a healthy planet, the very foundation that provides services for human wellbeing. We named the second latent factor "*Detrimental*" consequences. It primarily captured perceived negative consequences to society through environmental pollution (GAC_alt1 and GAC_alt3) although this factor also reflected elements of altruistic orientations (Altruistic). We named the third latent factor "*Biospheric*" consequences and revealed expectations of negative consequences to flora and fauna. Only one construct loaded on factor 3 (GAC_bio1) but had the highest loading. All three factors showed high internal consistency and reliability. The exclusion of GAC_bio2 improved scale reliability and consistency of "*Biospheric*" by an alpha value of 0.30. The GAC_bio2 construct did not have any significant loading likely due to distribution of responses with both

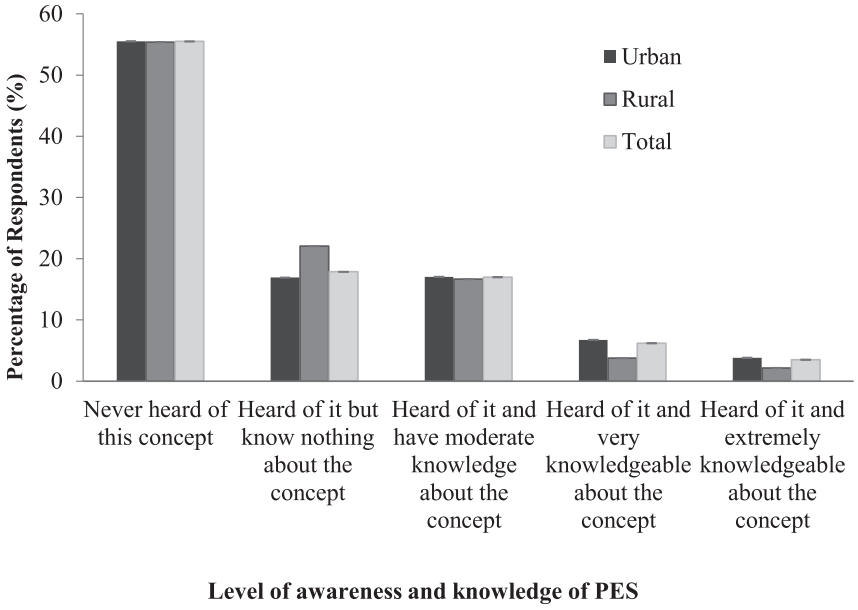

Fig. 3. Respondents' level of awareness and knowledge of PES concept.

Table 1
Mean and Standard deviations of responses to level of importance of non-market forest ecosystem services.

Ecosystem services[a]	Description	Urban		Rural		Overall	
		Mean	SD	Mean	SD	Mean	SD
Regulation Services	Forests purify and release fresh water into rivers and streams	4.274	0.889	4.296	0.959	4.280	0.902
	Forests maintain clean air quality and regulate temperature	4.332	0.871	4.376	0.903	4.34	0.877
	Forests help control natural disasters including flooding	4.261	0.869	4.269	0.912	4.260	0.878
Habitat Services	Forests provide favorable living places for plants and animals[b]	4.310	0.855	4.371	0.915	4.325	0.866
Cultural Services	Forests contribute beautiful landscapes and greenness to the environment	4.205	0.914	4.237	0.994	4.211	0.929
	Forests are sacred places which carry spiritual and historic values carry spiritual and historic values	3.760	1.146	3.812	1.099	3.782	1.134
	Forests offer opportunities for scientific research and education[c]	4.084	0.944	4.000	0.995	4.069	0.954

Level of importance was measured on a 5-point Likert scale ranging from (1 = Not at all important, 3 = Slightly important, 5 = Extremely important).
[a] Classification of services adapted from de Groot et al. (2002), MA (2003), Hein et al. (2006) and de Groot et al. (2010).
[b] Statistically significant difference between urban and rural respondents (p-value < 0.10).
[c] Statistically significant difference between urban and rural respondents (p-value < 0.05).

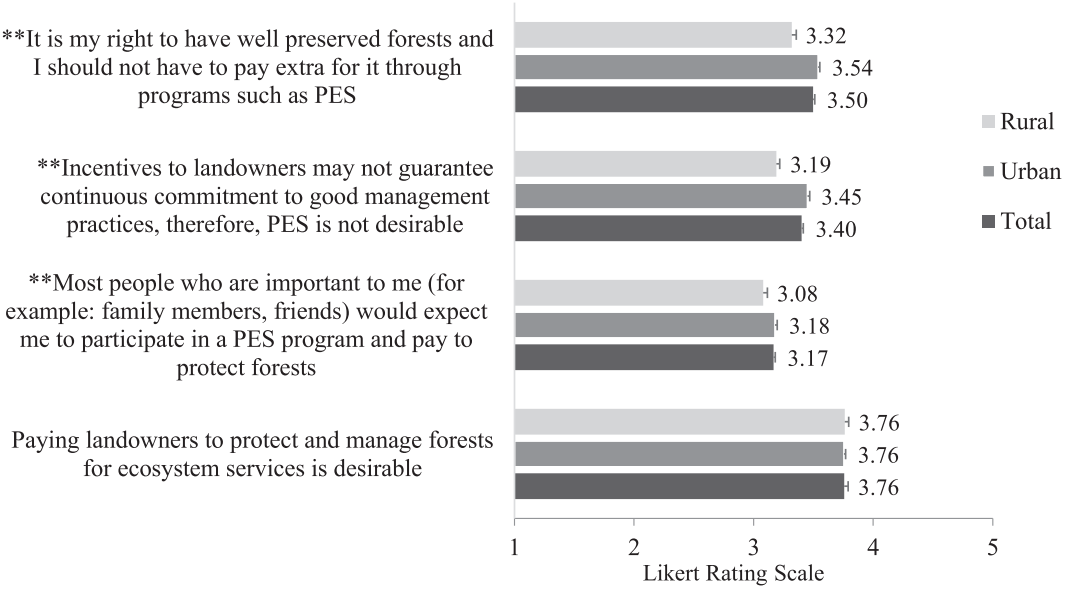

Fig. 4. Respondents' level of agreement with attitudinal statement towards PES concept assessed on a 5-point Likert scale (1 = Strongly disagree, 3 = Neither agree nor disagree, 5 = Strongly agree). Statistical significant differences (t-test) between urban and rural respondents: ** Statistically significant difference (p-value < 0.05).

Table 2
Distribution of responses to statements of GAC scale and personal norms.

Item	GAC statements in survey (variable)	Percent				
		1	2	3	4	5
Egoistic (GAC_ego)						
GAC_ego1	Environmental protection will provide a better world for me and my children[a,d]	1.60	2.99	16.87	35.13	43.41
GAC_ego2	Environmental protection is beneficial to my health[a,b,d]	0.80	1.30	14.47	33.23	50.20
GAC_ego3	A clean environment provides me with better opportunities for recreation[a,b,d]	0.50	2.00	14.67	42.51	40.32
Altruistic (GAC_alt)						
GAC_alt1	The effects of environmental pollution on public health are worse than we realize[a,b,c,d]	2.59	7.19	22.16	40.92	27.15
GAC_alt2	Environmental protection benefits everyone[a,b,d]	1.00	2.89	13.77	32.53	49.80
GAC_alt3	Environmental pollution generated here in the U.S. harms people all over the world[a,b,c,d]	2.69	5.39	22.85	36.03	33.03
Biospheric (GAC_bio)						
GAC_bio1	Over the next decade, thousands of species of plants and animals will become extinct[a,b,c,d]	2.10	7.29	24.85	42.81	22.95
GAC_bio2	Claims that current levels of environmental pollution are changing the Earth's climate are exaggerated[a,b,d]	19.16	18.86	22.75	22.65	16.57
GAC_bio3	Tropical rainforests are essential in maintaining a healthy planet[a]	0.50	1.20	13.07	33.13	52.10
Personal norm (P_norm)						
P_norm	I feel a sense of responsibility to help protect forest watersheds around the world for others to benefit[c,d,e,f]	6.89	7.49	27.35	40.62	17.66

1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, 5 = Strongly agree. Statements adapted from
[a] Ryan and Spash (2012).
[b] Snelgar (2006).
[c] Gärling et al. (2003).
[d] Spash (2006).
[e] López-Mosquera and Sánchez (2012).
[f] Clark et al. (2003).

agreement and disagreement reported in equal numbers.

5.3. Ordered logit regression

Descriptive statistics of model variables and results of the ordered logit model including coefficients, marginal effects and standard errors are presented in Tables 4 and 5, respectively. All models were found to be statistically significant with p-values < 0.001 for corresponding log-likelihood ratio tests. There was consistency in the direction of β coefficients of the VBN, socio-economic and interaction variables in all three models. The test for proportional odds assumptions with a separate series of binary logistic regressions and the Wald-test for parallel lines showed no model violations.

In the VBN attributes-only model (Model 1), all variables were found to be statistically significant in explaining WTP levels. Detrimental and biospheric value orientations were directly associated with WTP levels both statistically significant with the former exhibiting a stronger statistical signal. Belief of beneficial (egoistic) environmental consequences had a statistically significant negative effect on WTP (p-value < 0.001). The results of the VBN model suggest that a unit increase in biospheric oriented values would result in a 0.007 increase in the ordered log-odds of being in a higher WTP response category, *ceteris peribus*. With a unitary increase in detrimental value orientation, the probability of an individual being in the higher WTP response category increased by an average 0.013, else constant. The variable capturing personal norms and perceived ability to reduce threat had positive coefficients with statistically significant effects. A unit increase in personal norms was associated with a 0.066 increase in the ordered log-odds of being in the higher WTP response category, *ceteris paribus*. The marginal effects on education and annual household income were 0.006 and 0.010 respectively. For a unit increase in educational and annual household income levels, we expect 0.006 and 0.010 increases in the ordered log-odds of being in a higher WTP response category, respectively. As expected, the effect of cost of the PES program has a statistically significant (p-value < 0.001) negative impact on WTP. Respondents were less likely to be willing to pay for the proposed PES program at increasing program costs.

Fig. 5 provides the percentages of WTP to the proposed PES

Table 3
Latent factor loadings for general awareness of environmental consequences constructs for current and two previous studies.

GAC items	Factor Loadings								
	This study			Spash (2006)			Ojea and Loureiro (2007)		
	Factor 1 Beneficial	Factor 2 Detrimental	Factor 3 Biospheric	Factor 1 EgoAlt	Factor 2 Socio-Bio	Factor 3 NN	Factor 1 Egoistic	Factor 2 Altruistic	Factor 3 Biospheric
GAC_ego1	0.66	0.25	0.28	0.79	0.23	−0.20	0.93	0.31	−0.05
GAC_ego2	0.79	0.26	0.26	0.54	0.29	−0.01	0.90	0.3	−0.11
GAC_ego3	0.65	0.37	0.16	0.51	0.25	−0.13	NA	NA	NA
Cronbach's alpha = 0.83									
GAC_alt1	0.36	0.61	0.28	0.39	0.46	0.12	0.69	0.01	0.18
GAC_alt2	0.74	0.35	0.22	0.44	0.38	−0.09	0.66	−0.1	0.06
GAC_alt3	0.29	0.81	0.24	0.24	0.71	0.07	NA	NA	NA
Cronbach's alpha = 0.80									
GAC_bio1	0.24	0.19	0.95	0.12	0.55	−0.14	0.06	−0.07	0.03
GAC_bio2[a]	−0.17	−0.03	0.04	−0.22	−0.03	0.36	−0.52	0.48	0.05
GAC_bio3	0.77	0.17	0.25	NA	NA	NA	NA	NA	NA
Cronbach's alpha = 0.62									

Latent factor loadings of current study extracted using maximum likelihood principal factor analysis and varimax rotation. Underlined values denote significance of factor loadings (>0.40) according to Hair et al. (2010); NN= No scale item loaded on this factor, not named nor considered for further analysis; NA = Not applicable.
[a] Item excluded to improve internal consistency in subsequent analysis.

Table 4
Definitions and descriptive statistics of model variables in sample.

Variable	Definition	Min.	Max.	Standard Deviation	Description
Dependent Variable					
WTP_PES (Y)	Ordinal WTP for bundled restoration of ES services in another state's forest watershed through PES program	1	5	1.447	1 = Definitely not pay the specified amount, 2 = Probably not pay the specified amount,3 = Probably pay the specified amount,4 = Very likely pay the specified amount, 5 = Definitely pay the specified amount
Explanatory Variables					
Biospheric	Latent factor of actions motivated by concern of consequences on nature	−2.827	0.083	0.673	Predicted scores of factor loadings using EFA
Beneficial (egoistic)	Latent factor of actions motivated by concerns that environmental protection has positive consequences on one's self	−3.896	0.925	0.879	Predicted scores of factor loadings using EFA
Detrimental	Latent factor of actions motivated by perceived negative consequences to society in the U.S. and globally	−3.111	1.069	0.867	Predicted scores of factor loadings using EFA
P_norm	Self-reported sense of obligation to take action to protect forest watersheds around the world	1	5	1.078	1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, 5 = Strongly agree
BundleESCost	Annual household cost per year for the PES watershed restoration program	30	150	42.431	Annual US$ cost levels household^{-1} year^{-1}: 30, 60, 90, 120, 150
Education	Level of respondent's education	1	5	1.242	1 = Some high school or less, high school or GED, 2 = Some college or post high school training, 3 = College degree (2-year or 4-year college degree), 4 = Graduate or professional training beyond a 4-year college degree, 5 = Other forms of education
Hhincome	Annual household income	1	5	1.366	1 = less than US$30,000, 2 = US$30,000 to US$49,999, 3 = US$50,000 to US$99,999, 4 = US$100,000 to US$119,999, 5 = greater than US$120,000
PES_aware	Awareness of PES as a conservation tool for ecosystem services provision and sustainability	1	5	1.234	1 = Never heard of this concept, 2 = Heard of it but know nothing about it, 3 = Heard of it and have moderate knowledge about it, 4 = Heard of it and very knowledgeable about it, 5 = Heard of it and am extremely knowledgeable about it
PES_att	Attitude towards PES (extent of agreement on desirability of paying landowners to protect and manage forests for ecosystem services)	1	5	0.915	1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, 5 = Strongly agree
Kn_nonmketES	Level of familiarity about the concept of non-market ecosystem services	1	5	1.296	1 = Not at all familiar, 2 = Slightly familiar, 3 = Moderately familiar, 4 = Very familiar, 5 = Extremely familiar
Urb_rur	Respondents' living or area of residence[a]	0	1	0.389	0 = Lives or identify as living in a rural area, 1 = Lives in an urban clusters or urban area
Visit_fr_anostate	Respondents' past visits to a forest in another state	0	1	0.489	0 = Never visited a forest in another state, 1 = Visited a forest in another state
Visit_fws_anostate	Respondents' past visit to a forest watershed in another state	0	1	0.496	0 = Never visited a forest watershed in another state, 1 = Visited a forest watershed in another state
Gender	Respondent's gender	0	1	0.499	0 = male, 1 = female
Age	Age group of respondent	1	6	1.606	1 = 18–24 years, 2 = 25–34 years, 3 = 35–44 years, 4 = 45–54 years, 5 = 55–64 years, 6 = 65 years and older
Interaction variables					
Education_Income	Interaction variable between respondents education and income	1	20	6.1686	Interaction: income and education (1 = minimum education and income level to 20 = highest education and income)
Biospheric × age (Bio_age)	Interaction variable between biospheric orientation and respondents Age	−16.963	55.002	2.631	Interaction: predicted scores of biospheric and age category (1 = 18–24 years to 6 = 65 years and older)
Beneficial (egoistic) × age (Ben_age)	Interaction variable between Beneficial orientation and respondents Age	−23.378	5.550	3.474	Interaction: predicted scores of beneficial and age category (1 = 18–24 years to 6 = 65 years and older)
Detrimental × age (Det_age)	Interaction variable between detrimental orientation and respondents Age	−18.663	6.411	3.593	Interaction: predicted scores of detrimental and age category (1 = 18–24 years to 6 = 65 years and older)
Biospheric × education (Bio_education)	Interaction variable between biospheric orientation and respondents education	−19.790	5.002	2.749	Interaction: predicted scores of biospheric and education (1 = Some high school or less, to high school or GED to 5 = Other forms of education)
Beneficial	(egoistic) × education (Ben_education)				Interaction variable between beneficial orientation and respondents education
−27.274	5.551	3.651			Interaction: predicted scores of beneficial and education category (1 = Some high school or less, to high school or GED to 5 = Other forms of education)
	Detrimental × education (Det_education)				Interaction variable between detrimental orientation and respondents education
−21.774	3.669	6.411			Interaction: predicted scores of detrimental and education category (1 = Some high school or less, to high school or GED to 5 = Other forms of education)

(*continued on next page*)

Table 4 (*continued*)

Variable	Definition	Min.	Max.	Standard Deviation	Description
Biospheric × income (Bio_incom)	Interaction variable between biospheric orientation and respondents Household income	−12.701	7.502	3.161	Interaction: predicted scores of biospheric and income category (1 = less than $30,000 to 5 = greater than $120,000)
Beneficial (egoistic) × income (Ben_incom)	Interaction variable between beneficial orientation and respondents Household income	−21.249	8.836	4.233	Interaction: predicted scores of beneficial and income category (1 = less than $30,000 to 5 = greater than $120,000)
Detrimental × income (Det_incom)	Interaction variable between detrimental orientation and respondents Household income	−25.516	9.617	4.246	Interaction: predicted scores of detrimental and income category (1 = less than $30,000 to 5 = greater than $120,000))

[a] Classification of living area was based on the US Census Bureau (2015) urban-rural classification.

program at different annual household costs. More than half (51.4%) of respondents were very likely or definitely willing to pay to support the PES program at an annual household cost of US$ 30.00. However, at an annual cost of US$ 60.00 and US$ 90.00, the percentage of respondents in this same response categories ("very likely pay this amount" or "definitely willing to pay this amount") decreased to 36.0% and 21.6% respectively. Increasing the annual household cost to US$120.00 and US$ 150.00 further decreased the percentage of respondents who were willing to pay (i.e. very likely or definitely willing to pay this amount) to 14.7% and 13.8%, respectively.

In Model 2, that also controlled for the effects of attitudes toward PES and non-market ecosystem services, urban/rural dwellings, gender, and age, the marginal effects of value orientation variables and personal norms were lower than in Model 1 but their effects maintained the same direction. Awareness and attitudes were all positively associated with higher WTP likelihood as expected and exhibited strong statistical significance (p-value < 0.01). Urban respondents were less likely to be willing to pay to support the proposed PES program compared to rural respondents but the difference was statistically insignificant. The ordered log-odds for female respondents being in the higher WTP response category was 0.009 less than male respondents at a statistically significant level (p-value < 0.05). A unit increase in age category was significantly associated with 0.012 decrease in the odds of being in a higher WTP response category, *ceteris paribus*. Results also indicate that *ceteris paribus,* a unit increase in the level of familiarity with non-market ecosystem services was associated with 0.010 increase in the ordered log-odds of being in a higher WTP response category at a statistically significant level (p-value < 0.001). Respondents who had visited a forest or a forest watershed were more likely to be willing to pay to support the proposed watershed PES program compared to those who had not done so.

Model 3 (VBN + attitudes and demographic + interaction terms) presents an analysis that controlled for effects of education, age and income with the three distinct value orientations. The inclusion of all interaction variables provided better model fit with lesser AIC value and higher Nagelkerke R^2 of 0.45. Only age effects with beneficial (egoistic) and detrimental value orientation interaction variables were statistically significant. Thus, controlling for all other variables, older respondents who are orientated in their beliefs of beneficial environmental consequences were more likely to be willing to pay to support a PES program relative to younger respondents of the same value orientation. For example, a unit increase in beneficial (egoistic) value orientation and age was associated with 0.008 increase in the ordered log-odds of being in a higher WTP response category at a statistically significant level (p-value < 0.001). Nonetheless, sole age effects showed that on average older respondents with beliefs of detrimental environmental consequences were less likely to be willing to pay to support the PES program (p-value = 0.04), *ceteris paribus*.

Table 6 shows the perceived economic values (mean WTP and respective confidence intervals) estimated from the ordered logit regression (Model 3). Generally, the computed WTP amounts reflect the relative economic value for each value orientation towards paying for a change from a degraded watershed ecosystem to one that is capable of providing moderate level of bundled improved water quality, habitat for plant and animal species and enhanced landscape beauty. The range of monetary estimates was between US$ 15.53 and US$ (-)30.00 household^{-1} year^{-1}. Mean WTP estimate for the entire sample was computed as US$ 66.14 household^{-1} year^{-1}. This suggests that on average, a respondent irrespective of their value orientations was willing to pay US$ 66.14 household^{-1} year^{-1} on average to restore an out-of-state degraded watershed ecosystem under a PES scheme. This amount is above the preset minimum cost of US$ 30.00 household^{-1} year^{-1} but below the average of US$ 90.00 household^{-1} year^{-1}. Results show negative mean WTP monetary estimates for individuals with beliefs of beneficial (egoistic) environmental consequences while positive mean WTP estimates were obtained for both biospheric and detrimental value orientations. The estimated mean WTP for biospheric is four times higher than the detrimental value orientation. Nevertheless, all three value orientations show a negative lower bound WTP, an indication of the wide heterogeneity in willingness to participate and pay for a distant PES program irrespective of the value orientation.

6. Discussion

Findings show that U.S. respondents were generally unfamiliar with the concepts of "ecosystem services", "non-market ecosystem services" and "PES". The term "ecosystem" however, was the most familiar. Rural residents were generally less familiar with the term ecosystem services, non-market ecosystem services and PES than urban counterparts. A likely explanation is that, urban respondents had higher education levels and had higher percentage of respondents who were affiliated or contributed financially to an environmental conservation or forestry related group than rural respondents. We argue that urban residents, likely due to higher exposure and awareness of pollution have long been found to be more environmentally concerned than rural residents (Tremblay and Dunlap, 1978). These concerns are likely to translate into acquiring more information, and hence greater familiarity, with environmental issues. Our findings corroborate a level of familiarity reported by Baur et al. (2014) for respondents in the state of Oregon who were most familiar with the term "ecosystem" but generally unfamiliar with "ecosystem services". Cheatum et al. (2011) also found ranchers in California were not familiar with the terms "ecosystem services" or "payments for ecosystem service". Our findings offer insights into potential beneficiaries' perceptions and knowledge of key attributes of PES and highlight the limited knowledge gap among the wider population. As argued by

Table 5
Ordered logit regression of WTP levels for bundled ES provision through PES program.

Variables	Model 1: VBN attributes		Model 2: VBN attributes, Attitudes & Demographic		Model 3:VBN attributes, Attitudes, Demographic & interaction variables	
	Coeff. (std. error)	Marginal effects	Coeff.	Marginal effects	Coeff.	Marginal effects
Biospheric	0.105* (0.064)	0.007 (0.004)	0.085 (0.067)	0.005 (0.004)	0.337* (0.203)	0.018 (0.011)
Beneficial (egoistic)	−0.184*** (0.054)	−0.013 (0.004)	−0.130** (0.055)	−0.007 (0.003)	−0.661*** (0.181)	−0.036 (0.010)
Detrimental	0.187*** (0.049)	0.013 (0.003)	0.099* (0.051)	0.005 (0.003)	0.086 (0.164)	0.005 (0.009)
P_norm	0.945*** (0.034)	0.066 (0.003)	0.727*** (0.035)	0.040 (0.002)	0.722 *** (0.035)	0.040 (0.002)
BundleESCost	−0.020*** (0.001)	−0.001 (0.000)	−0.022*** (0.001)	−0.001 (0.000)	−0.022*** (0.001)	−0.001 (0.00)
Education	0.089*** (0.026)	0.006 (0.002)	0.082*** (0.027)	0.005 (0.002)	0.114** (0.053)	0.006 (0.003)
HHincom	0.143*** (0.024)	0.010 (0.002)	0.092*** (0.025)	0.005 (0.001)	0.116** (0.060)	0.006 (0.003)
PES_aware			0.367*** (0.029)	0.020 (0.002)	0.359*** (0.029)	0.019 (0.002)
PES_att			0.218*** (0.037)	0.012 (0.002)	0.219*** (0.037)	0.012 (0.002)
Kn_nonmketES			0.145*** (0.026)	0.008 (0.001)	0.145*** (0.026)	0.010 (0.002)
Urban_rur			−0.072 (0.076)	−0.004 (0.004)	−0.068 (0.076)	−0.004 (0.004)
Vis_for_anstate			0.169** (0.070)	0.009 (0.004)	0.179** (0.071)	0.009 (0.004)
Vis_fws_anstate			0.213*** (0.071)	0.012 (0.004)	0.202*** (0.072)	0.011 (0.004)
Gender			−0.155** (0.057)	−0.009 (0.003)	−0.168 *** (0.058)	−0.009 (0.003)
Age			−0.216*** (0.019)	−0.012 (0.001)	−0.222*** (0.019)	−0.012 (0.001)
Educ_income					−0.010 (0.019)	−0.001 (0.001)
Bio_age					−0.012 (0.040)	−0.001 (0.002)
Ben_age					0.141*** (0.035)	0.008 (0.002)
Det_age					−0.064** (0.030)	−0.004 (0.002)
Bio_incom					0.018 (0.030)	0.001 (0.002)
Ben_incom					0.019 (0.025)	0.001 (0.001)
Det_incom					0.015 (0.021)	0.001 (0.001)
Bio_educ					−0.071 (0.046)	−0.004 (0.003)
Ben_educ					−0.010 (0.039)	−0.001 (0.002)
Det_educ					0.047 (0.035)	0.003 (0.002)
Intercept/cut1	1.537 (0.139)		1.526 (0.217)		1.543 (0.243)	
Intercept/cut2	2.453 (0.142)		2.548 (0.219)		2.572 (0.244)	
Intercept/cut3	3.464 (0.145)		3.696 (0.222)		3.725 (0.247)	
Intercept/cut4	4.654 (0.151)		5.010 (0.228)		5.043 (0.252)	
Log likelihood	−6167.3653		−6167.3653		−6150.0464	
Pseudo R^2	0.1373		0.185		0.1872	
LR Chi^2	2077.15 (7)		2799.15 (14)		2833.79 (25)	
Prob > Chi^2	<0.001		<0.001		<0.001	
Nagelkerke R^2	0.357		0.450		0.454	
AIC	13078.74		12372.73		12358.09	
BIC	13150.45		12496.60		12547.15	

Statistical significance: * = p-value < 0.1, ** = p-value < 0.05; *** = p-value < 0.001.

Muradian et al. (2010) social perceptions about relationships between land use and provision of ecosystem services are crucial to determining PES feasibility. Therefore, sensitizing citizens on these key concepts should be integral to PES design and implementation.

Results on attitudes toward the importance of non-market forest ecosystem to respondents conform to past studies that assessed public attitudes toward ecosystem services and PES across different populations. Respondents self-reported "maintenance of clean air quality and regulation of temperature" as the most important non-market service provided by forests. This is consistent with findings of Martín-López et al. (2012) in that air purification reportedly had the highest importance among Spanish respondents. In terms of ecosystem service categories, 'habitat services' was on average the most important. Our findings are congruent with Castro et al.

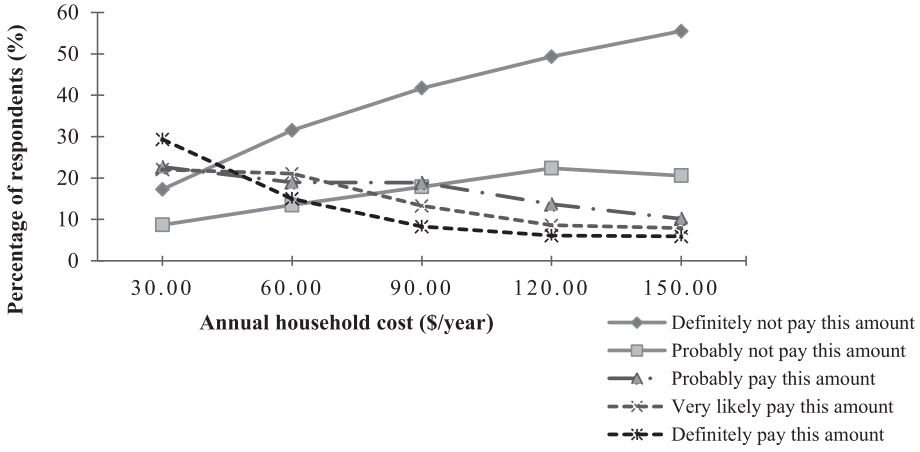

Fig. 5. WTP to restore a distant degraded forest watershed for bundled ecosystem services provision through PES at different proposed annual household cost.

Table 6
Value orientation and perceived economic values (Mean WTP).

	Mean WTP estimates	95 percent confidence interval[a]	
	(US$ per household per year)		
Biospheric	15.53*	−2.07	33.03
Beneficial (egoistic)	−30.48***	−13.73	−48.18
Detrimental	3.96	−10.27	19.37
Whole Sample	66.14***	50.48	81.78

Statistical significance: * = p-value < 0.1, ** = p-value < 0.05; *** = p-value < 0.001.
[a] 95% confidence intervals computed using parametric bootstrapping.

(2016) who found habitat services as the most important watershed ecosystem services to stakeholder groups in the South-Central U.S. Furthermore, our findings suggest a general positive attitude towards PES programs. PES was acknowledged by a majority of respondents as a desirable concept and seemingly shows wider acceptability among potential beneficiaries. These findings reflect similar attitudes reported among stakeholders in the UK who revealed no strong concerns about PES if designed properly (Duncan, 2014). Similarly, Moreno-Sanchez et al. (2012) found positive perceptions of implementing a PES program to improve water quality among households in Colombia.

Analysis of the GAC using EFA showed dominance of two among three latent value orientations. Our loadings and factors paralleled those of Spash (2006), Ojea and Loureiro (2007) and Ryan and Spash (2012) challenging the three latent factors of the GAC (Snelgar, 2006; Spash, 2006). Our results captured a dominant latent factor comprised largely of egoistic constructs with altruistic and biospheric traits. Our interpretation, hence, is that this factor captured self-centered beneficial consequences; i.e., beliefs that environmental protection has positive consequences mainly on one's self, with traits of spillover benefits to other people and the biosphere. Interestingly, a similar classification for a factor that captures "beliefs that environmental protection has positive consequences" has been proposed as a GAC subscale by Ryan and Spash (2012). Clearly, the GAC scale failed to cognitively distinguish the underlying biospheric, altruistic and egoistic value orientations posited under the VBN. Other authors have arrived to similar conclusions (e.g. Snelgar, 2006; Spash, 2006). Furthermore, the loadings on biospheric factor are similar to loadings from Ojea and Loureiro (2007). Contrary to the lack of altruistic distinction observed by Ojea and Loureiro (2007), our findings are congruent with Ryan and Spash (2012) that found GAC_alt 1 and GAC_alt 3 loaded on one distinct factor of altruistic connotations. This latent factor reveals the belief that negative environmental consequences affect all people.

The predictive power of the VBN attributes further affirms the relationship between ethical dimensions and WTP for environmental improvement noted in previous studies (Hansla et al., 2008; Luzar and Cosse, 1998; Ojea and Loureiro, 2007; Ryan and Spash, 2010). The important role that social values, beliefs and norms play in the design and implementation of PES schemes has been reiterated by Muradian et al. (2010). In this study, the variable capturing personal norms was found to be a strong determinant of WTP. This reflects the relative importance of personal norms besides value orientations. It reinforces findings from previous studies (Nordlund and Garvill, 2002; Sauer and Fischer, 2010; López-Mosquera and Sánchez, 2012) that established the importance of personal norms in pro-environmental behavior and WTP. Our findings show positive effects of biospheric and detrimental orientations on WTP which is consistent with López-Mosquera and Sánchez (2012). As noted by Loomis and Mueller (2013), WTP for existence values often exhibits distance decay compared to use values. Therefore, positive effects of biospheric and detrimental orientations on WTP to restore the instrumented out-of-state forest watershed reveal that, irrespective of proximity, people would be more likely to support a PES program based on ethical values associated with beliefs of general environmental consequences on the biosphere and that of perceived negative consequences of environmental pollution (detrimental).

The negative effect of beneficial (egoistic) value orientations on WTP confirms the assertions of Schwartz (1992, 1994) and Hansla et al. (2008). There is a tendency among self-centered individuals to be willing to pay to support the PES program based on self-positive consequences or a threat to their wealth, power or authority. The hypothesized PES program may not offer direct benefits since the intended ecosystem to be improved was an out-of-state forest watershed, hence self-centered motivations were associated with lower WTP levels. This finding is likely made implicit by De Groot and Steg (2008) and Hoyos et al. (2012) that found negative effects of egoistic orientation on awareness of environmental consequences and WTP for natural resource protection, respectively. The observed signs of all VBN attributes seem plausible since individuals who reportedly care about environmental consequences on the biosphere and detrimental impacts on others were more likely to be willing to pay to avert negative environmental consequences irrespective of proximity.

Our results showed the importance of considering attitudinal, demographic and psycho-social variables when predicting WTP. This is suggested by the better fit of Model 3. The nuances associated with particular explanatory variables (e.g. age), and the dominance of expected beliefs of self-centered environmental consequences as a strong predictor of WTP levels for a PES program among the three value orientations. Associations of respondents' demographic information were consistent with other studies across different populations (Kreye and Adams, 2014; Lo and Jim, 2010, López-Mosquera and Sánchez, 2012; Ojea and Loureiro, 2007; Spash et al., 2009). Education and annual household income had a positive effect on WTP levels while the opposite was observed among older age groups. Conversely, Sulo et al. (2012) and Calderon et al. (2012) found an inverse relationship between level of education and WTP for forest environmental service in Kenya and for improved forest watershed services in the Philippines, respectively. This model showed the complexity of age effects. On average an older age group had a lower WTP level, however, this effect was linked with beneficial and detrimental value orientations as captured in interaction terms. Negative age effects were accentuated by detrimental, and ameliorated by beneficial, perceived consequences.

WTP monetary estimates reflect the economic value for our particular PES restoration program distinguishing the effects of three value orientations. Following Hoyos et al. (2012), we expected egoistic (benefit-driven) orientation to have lower economic value for non-use environmental attributes. The estimated negative values for egoistic beneficial value orientation confirm this expectation and suggest that paying for an out-of-state watershed PES restoration program would made them worse off because of a lack of dominant self-centered benefits (Hanley et al., 2013). Moreover, in the context of the particular ecosystem to be restored, and following Schwartz's theory where altruism is the most important factor in environmental attitude formation (Schwartz, 1970), respondents with dominant detrimental value orientations were expected to have the highest economic values as they are more likely to support benefits for others. However, our results show the perceived economic values based on biospheric value orientation was four times greater. The lack of more direct use values for the improved watershed might be the explanation for this trend. Therefore, a higher perceived economic value associated with the existence of a functioning biosphere (flora and fauna) irrespective

of proximity seems plausible. Economic values also seem tied to latent environmental attitudes of respondents particularly when attitudes were expressed before WTP questions. This association has been reported by Ojea and Loureiro (2007). Our findings highlight differences between the concept of WTP to support a pro-environmental initiative and inherent economic values for outcomes of the initiative based on different beliefs. For example, individuals with self-benefit-driven value orientations were less likely to pay to support an out-of-state PES program and exhibited negative perceived economic values. Arguably, these individuals may find somewhat unjustifiable to pay the polluter to secure benefits out of a PES program. This offers additional insight into the relative importance and the role different value orientations play in decisions involving financial contributions to support pro-environmental initiatives including PES. As management of PES programs seek to promote positive environmental conservation outcomes, (Clements, 2013; Ferraro and Pattanayak, 2006), the public would expect to pay money for "something" of net benefit.

7. Conclusions

U.S residents, whether urban or rural, showed a low level of familiarity and knowledge of the concepts of non-market ecosystem services and PES. Nevertheless, respondents had moderately positive attitudes toward PES and somewhat agreed to the desirability of paying landowners to manage and conserve forest for ecosystem services. Given the importance of the impacts of the VBN attributes and that of the level of familiarity of non-market ecosystem services and PES as a concept, PES planning strategies might need to aim at environmental education programs in order to enhance public views and positive attitudes toward non-market forest ecosystem services and PES.

The EFA of responses to the GAC scale showed dominance of a latent factor capturing beneficial consequences driven by self-centered orientations with traits of altruistic and biospheric motivations. This was followed by a detrimental factor associated with negative consequences to humans, and a biospheric factor encompassing benefits to flora and fauna. This categorization (beneficial, detrimental, biospheric) offers a deviation from the proposed GAC categories of egoistic, altruistic and biospheric with the commonality that the first two factors are largely anthropogenic-centered with the third being bio-centric.

Association between VBN constructs and stated WTP levels show the importance of expected beneficial (egoistic) and detrimental consequences. Of the two, expected consequential benefits consistently showed a negative and significant effect. This finding is likely the result of the WTP estimation to restore a forested watershed ecosystem in another state of the respondents' residence. Since this latent factor captured egoistic motivations and the ecosystem in question might not offer any direct benefits, associated participation in a PES program would be a source of disutility as reflected on its negative effect on WTP. Although there were differences in knowledge and attitudes between urban and rural residents these did not yield different WTP estimates. Rather, variance in WTP levels was explained by differences in levels of awareness, attitudes, gender, age, income, and education. WTP estimates provide information on the economic values of ecosystem services. Detrimental and biospheric value orientations derived positive economic values from a hypothetical PES program seeking to improve ecosystem services in an out-of-state forest watershed. As expected, a negative economic value was associated with self-centered beneficial value orientation.

Our results suggest it is imperative to focus on human dimensions including values, beliefs and norms in designing market-based conservation initiatives such as PES. Enhancing the level of knowledge of forest non-market benefits could ultimately facilitate pro-environmental behaviors and enhance favorable WTP for PES programs. As this study has shown, even for a geographically distant watershed ecosystem, individuals with favorable ascriptions to personal norms, strong orientation towards beliefs of biospheric and detrimental environmental consequences are willing to support initiatives that improve ecosystem services provision.

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Appendix 1. Description of correlation, Cronbach's alpha coefficients and KMO estimate.

Item	Sign	correlation	item-rest correlation	inter-item covariance	Cronbach's alpha	KMO
GACego1	+	0.763	0.684	0.345	0.825	0.945
GACego2	+	0.821	0.766	0.345	0.819	0.907
GACego3	+	0.752	0.683	0.359	0.828	0.935
GACalt1	+	0.729	0.633	0.345	0.829	0.882
GACalt2	+	0.833	0.777	0.336	0.817	0.922
GACalt3	+	0.731	0.634	0.344	0.829	0.869
GACbio1	+	0.645	0.534	0.365	0.840	0.938
GACbio2	−	0.338	0.111	0.431	0.902	0.698
GACbio3	+	0.769	0.705	0.357	0.826	0.912
Test scale				0.359	0.852	0.913

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