Rangeland Ecol Manage 67:629–635 | November 2014 | DOI: 10.2111/REM-D-13-00114.1

Explaining Cattle Rancher Participation in Wildlife Conservation Technical Assistance Programs in the Southeastern United States

Adam S. Willcox[1] and William M. Giuliano[2]

Authors are [1]Research Assistant Professor, Department of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN 37996 USA; and [2]Professor and Extension Specialist, Department of Wildlife Ecology and Conservation, University of Florida, Gainesville, FL 32611, USA.

Abstract

US natural resources and wildlife agencies have been increasing their efforts to involve cattle ranchers in wildlife conservation through technical assistance programs that provide for wildlife conservation activities. Understanding why ranchers choose to be involved in these programs is fundamental to increasing participation and ensuring their success. Using the theory of planned behavior as a theoretical model, we surveyed 1 093 ranchers in Alabama, Florida, Georgia, and Mississippi to explain and predict intention to participate in technical assistance programs, specifically, wildlife workshops and field days. All three theory components—attitude, subjective norm, and perceived behavioral control—were important to intent to participate and explained 41% of the variance, with perceived behavioral control and subjective norm having the greatest standardized effects ($\beta=0.329$ and $\beta=0.316$, respectively). Investigation of the construct components yielded insight into how agencies could increase participation. Ranchers generally held positive attitudes toward wildlife workshops, perceiving them to be a good way to learn about wildlife management and perceiving that most ranches were suitable for wildlife, an instance of perceived behavioral control. However, ranchers did not perceive that workshops and field days were widely advertised or promoted, limiting the amount of perceived control they had over their participation. Additionally, ranchers identified normative groups whose opinions were important to them, namely their families, friends and neighbors, fellow ranchers, and agency staff. However, these same groups were not seen to actively encourage ranchers to participate in technical field days and workshops. Using key members of these normative groups to advertise and promote workshops and field days among their peers should increase rancher behavioral control and attitudes associated with technical workshops and field days. Employing strategies from this research to increase attendance at technical workshops and field days should improve wildlife conservation technical assistance program effects.

Key Words: conservation behavior, Farm Bill, field days, rancher, theory of planned behavior, workshops

INTRODUCTION

Since the mid-1980s, US federal and state legislation has enabled wildlife conservation and natural resource agencies to fund private lands conservation programs. The pioneer programs were described in the conservation provisions of the 1985 Food Securities Act, more commonly referred to as the Farm Bill. The Farm Bill conservation provisions, and associated programs, are implemented by the US Department of Agriculture's (USDA's) Natural Resources Conservation Service (NRCS) and Farm Service Agency.

The Farm Bill programs fall into three general categories: land retirement, financial assistance, and technical assistance (Lambert et al. 2006). Additionally, most state wildlife and natural resource conservation agencies have variants of each type of program, the funding for which is dependent on federal and state legislation. Land retirement programs involve long-term or permanent land sequestration from many farming activities and are usually tied directly to the land deed or title, thus permanently limiting future land developments. Retirement programs, although extremely beneficial for conservation and wildlife, appeal to specific types of agricultural producer, usually those nearing retirement or with low-production operations (Lambert et al. 2006). In contrast, Farm Bill financial and technical assistance programs strive to improve conservation on working ranches and farmlands. Until recently, the primary conservation-related financial and technical assistance programs overseen by NRCS were the Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentives Program (WHIP), and Conservation Technical Assistance Program (Stubbs 2010). Under these programs, the federal government allocates funds to NRCS. Some of these allocations are used to financially incentivize on-farm projects by sharing the cost of approved conservation activities. Remaining allocations are used for technical assistance programs that include conducting technical trainings and workshops, developing individual conservation plans, and producing educational materials. EQIP allocations more than tripled from an initial \$200 million $\cdot$ yr^{-1} under the 1996 Farm Bill to \$627 million $\cdot$ yr^{-1} in 2003, and then to \$1.2 billion in 2008 (NRCS 2013a). This trend continued with WHIP allocations doubling from \$21 million in 2003 to \$57 million in 2008 (NRCS 2013b). A new Farm Bill was passed through the legislature in early 2014. In this act, EQIP has now absorbed WHIP. It is unclear as to the implications of the 2014

Research was funded by the Renewable Resources Extension Act and the Dept of Wildlife Ecology and Conservation, University of Florida.

At the time of research, Willcox was a graduate assistant, Dept of Wildlife Ecology and Conservation, University of Florida, Gainesville, FL, USA.

Correspondence: Adam S. Willcox, Dept of Forestry, Wildlife and Fisheries, University of Tennessee, Knoxville, TN 37996, USA. Email: awillcox@utk.edu

Manuscript received 31 July 2013; manuscript accepted 23 July 2014.

© 2014 The Society for Range Management

Farm Bill on these programs as the final bill contained some cuts to overall EQIP funding and a minimum allocation of 5% of EQIP funds for WHIP (US House of Representatives 113th Congress 2014). Additionally, during the 2014 allocations process, EQIP was not fully funded, making future appropriation levels uncertain (National Wildlife Federation 2014).

Livestock producers, specifically cattle ranchers, are key recipients of financial and technical assistance, receiving, on average, 60% of EQIP funds (Lambert et al. 2006). Additionally, based on the number of acres impacted, the top two conservation practices recommended by Farm Bill technical service providers are prescribed grazing and upland wildlife habitat management (Stubbs 2010). Ranchland wildlife conservation can be improved as agencies technically support and fund programs that promote wildlife-beneficial ranch activities, including prescribed grazing, prescribed burning, planting wildlife-friendly vegetation, and habitat restoration (Haufler and Ganguli 2007). To effectively design and deliver these programs, it is important that agency field staff are able to maximize rancher participation to increase wildlife conservation impact. Additionally, technical assistance programs consisting of workshops and field days may become increasingly important if conservation assistance program funds decrease. In scenarios with reduced funding, it is likely fewer ranchers will receive financial assistance. However, participation in technical workshops and field days could be maintained or increased through targeted face-to-face programming and webinars, as increasing participant numbers do not usually add much to overall costs and many events do not cap attendance. It is therefore imperative that participation in conservation technical assistance programs is investigated and better understood to maximize effects. These types of data would enable agencies to reach out to ranchers currently not participating in technical assistance programs, while concurrently retaining past participants with contemporary, engaging content. To date, the studies addressing participation in conservation programs have focused on the financial incentive aspects, specifically, socioeconomic descriptions of the participants (Lambert et al. 2006), economic valuations related to EQIP contract withdrawals (Cattaneo 2003), and program cost effectiveness (Claassen et al. 2008).

The objective of our study was to predict cattle rancher participation in conservation technical assistance activities, specifically wildlife workshops and field days in Alabama, Florida, Georgia, and Mississippi. In doing so, we wanted to provide agency staff and other conservation practitioners with the means to improve participation in and delivery of technical wildlife conservation assistance programs.

METHODS

Theoretical Framework

The theory of planned behavior (TPB) is a social psychology model that explains individuals' intentions to enact behaviors (Ajzen 1988; Fishbein and Ajzen 2010). TPB primarily describes behaviors that are "goal-driven and steered by conscious self-regulatory processes" (Ajzen 2011). We selected TPB as our theoretical framework as it is likely cattle ranchers consciously manage their property and operation to attain production or wildlife management goals and that they may seek technical assistance by participating in workshops and field days to reach these goals. TPB has been applied to human dimensions of wildlife research to explain behaviors related to recreation (Rossi and Armstrong 1999; Hrubes et al. 2001; Martin and McCurdy 2009) and predict rancher participation in conservation easements (Brain et al. 2014) and integration of wildlife management into cattle operations (Willcox et al. 2012).

In TPB, behavioral intent—evidence of readiness to implement a behavior—is predicted by three explanatory variables: 1) attitude toward the behavior, 2) subjective norm, and 3) perceived behavioral control. These constructs are commonly obtained during a qualitative elicitation study and then estimated by calculating a general belief variable for each component multiplied by the perceived strength or degree of influence the belief has on the individual (Ajzen 1988; Fishbein and Ajzen 2010). The first variable, attitude toward the behavior, is acquired by asking several questions about the perceived outcome of engaging in a behavior paired with attitudinal strength questions that evaluate the importance of the outcome to the respondent. The final attitude toward the behavior is a summation (if more than one pair) of measured pairs, represented by the following equation (Ajzen 1988; Fishbein and Ajzen 2010):

$$A_B = \sum b_i e_i,$$

in which A_B is the calculated attitude toward the behavior. A_B is the sum of all sets ofb_i, the strength or degree of importance of the outcome, and a corresponding e_i, the outcome evaluation of engaging in the behavior.

The second explanatory variable, subjective norm, is a measure of how people, groups, and organizations that interact with respondents influence their decisions to engage in the behavior. As with attitude above, subjective norm is obtained by measuring normative beliefs of important social groups and motivation of the respondent to comply with those groups. Subjective norm is calculated similarly to attitude by substituting paired measures of normative beliefs and motivation to comply in the equation.

The final component, perceived behavioral control, is a measure of the perceived ease or difficulty of completing the behavior. As for the other variables, perceived behavioral control is measured using paired questions. The first question evaluates the belief that the control can positively or negatively affect the behavior, and the second, the power of this belief in relation to respondents' ability to enact the behavior. The equation for this component is identical to those above, except paired control belief and belief power are used instead of attitudinal and subjective norm measures. After calculating the three explanatory variables, they are regressed with behavioral intent as the dependent variable to predict the behavior.

Although TPB performs well in many studies predicting behavior, its ability to sufficiently explain behavioral intent has been challenged, leading some to suggest the need to add predictor variables (see Conner and Armitage 1998). Although TPB leaves open the possibility to add more variables, Fishbein and Ajzen (2010) advise caution for parsimony, and recommend that additional variables only be added after empirical exploration. We were interested in predicting rancher behavior to recommend strategies for agencies to improve technical

assistance programming, not in innovating social psychology theory. Rather than using inductive theory-building methods to frame our study, we chose TPB and expended our resources to conduct a detailed elicitation study. This allowed us to fully develop theory components and apply them to our target behavior. In addition to investigating if TPB simply predicted rancher participation in wildlife conservation and technical assistance workshops, we were able to develop and analyze detailed behavior-specific components of attitudes, subjective norms, and perceived behavioral control. Understanding these individual components enabled us to recommend targeted improvements to wildlife conservation technical assistance programs.

Rancher Survey

In spring 2008, we interviewed 15 beef cattle producers and five University of Florida livestock extension faculty as part of an elicitation study to design the TPB self-administered mail survey (Francis et al. 2004). The elicitation study enabled us to write a targeted TPB survey specific to the behavior (i.e., participation in wildlife management workshop and field days with a variety of topics) and the corresponding attitude, subjective norm, and perceived behavioral control measures related to workshop and field day participation. Ten human dimensions of agriculture, wildlife, and forestry experts; five wildlife agency personnel; and five ranchers in Florida and Georgia were sent survey drafts for comment and pilot testing. In the final survey, behavioral intent was measured using seven statements based on potential workshop and field day wildlife conservation topics and paired statements for attitude, subjective norm, and perceived behavioral control (Tables 1 and 2). Responses were recorded on five-point scales using ordered choices (i.e., 1=very unlikely to 5=very likely, and 1=strongly disagree to 5=strongly agree; Dillman et al. 2008). We included questions on socio-demographic and ranch characteristics to compare with the 2007 Census of Agriculture to assess nonresponse error (USDA 2009) and a question to determine if ranchers had previously participated in a wildlife technical workshop or field day. Socio-demographics, ranch characteristics, and previous participation could be considered background factors that potentially influence normative, behavioral, and control beliefs. However, background factors frequently explain only a small proportion of the variance and are difficult to identify simply due to the sheer number of potential background factors (Fishbein and Ajzen 2010). In our case, we regressed these background factors with all TPB components, did not find any practical significance, and excluded them from our regression model.

Our study area was defined as the Southeastern Plain and Southern Coastal Plain of Omernick's Level III ecoregions in Alabama, Florida, Georgia, and Mississippi (Center for Environmental Cooperation 1997). These warm and mostly flat areas have similar topography and climates, are considered good for cattle ranching, and historically contained a matrix of pine and deciduous forest, native range, and woodlands. In September 2008, we purchased a sampling frame of all 24,049 nondairy cattle producers in Alabama, Florida, Georgia, and Mississippi from the Farm Index of Central Address Systems, Inc (Central Address Systems, Inc, Omaha, NE). The Florida sampling frame was augmented with lists from the University of Florida's Cooperative Extension Service, as the purchased frame was small. The Mississippi list was also small, but supplemental lists could not be procured. The list was reduced by zip code to the study area in the Southern Coastal Plain and Southeastern Plains of Omernick's Level III ecoregions, resulting in 15 023 addresses (Center for Environmental Cooperation 1997).

Random samples of 500 ranchers were drawn from Alabama, Georgia, and two Florida strata. As the Mississippi sampling frame contained only 271 ranchers, they were all sampled. An additional 500 ranchers from Georgia were drawn to conduct a financial incentive effect methodological experiment (Willcox et al. 2010a). Florida was stratified based on landowner and ecosystems differences found in the literature; however, it later proved unnecessary as no differences were found between the strata for cattle producers (Clouser et al. 2007; Willcox et al. 2010b). Our final sample contained 2 771 addresses. We conducted a five-wave mailing following the tailored design method (Dillman et al. 2008), sending preletters, initial surveys, and reminder postcards in November 2008; replacement surveys in January 2009; and final replacement surveys in February 2009.

Data Analyses

We imputed missing data using maximum likelihood estimation (Schafer and Graham 2002). Likelihood ratio (G) analyses were used to assess nonresponse error by comparing demographic and ranch data with the 2007 Census of Agriculture

Table 1. Cattle rancher (n=1 093) perceptions of how likely they were to participate in a wildlife workshop or field day in the southeastern United States, 2009.

	Response category (%)					
Workshop or field day topic	Very unlikely	Unlikely	Neither unlikely nor likely	Likely	Very likely	$\bar{x}$ (SE)[1]
General wildlife habitat workshops or field days	191 (18)	312 (29)	257 (24)	289 (26)	44 (4)	2.7 (0.0)
Game species management workshops or field days	184 (17)	327 (30)	278 (25)	267 (24)	37 (3)	2.7 (0.0)
Agricultural systems planning workshops or field days that included wildlife management	162 (15)	239 (22)	299 (27)	342 (31)	51 (5)	2.9 (0.0)
Grazing systems management workshops or field days for both wildlife and cattle	128 (12)	179 (16)	247 (23)	449 (41)	90 (8)	3.2 (0.0)
Endangered species management workshops or field days	195 (18)	328 (30)	356 (33)	175 (16)	39 (4)	2.6 (0.0)
Watchable wildlife (e.g., songbirds) workshops or field days	205 (19)	304 (28)	341 (31)	193 (18)	50 (5)	2.6 (0.0)
Wildlife enterprise (e.g., hunting leases, ecotourism, husbandry, etc.) workshops or field days	267 (24)	364 (33)	231 (21)	183 (17)	48 (4)	2.4 (0.0)

[1]SE=0.0 were < 0.1.

Table 2. Cattle rancher ($n=1\,093$) agreement with attitude, subjective norm, and perceived behavioral control statements about participating in a wildlife workshop or field day in the southeastern United States, 2009.

		Response category (%)					
Theory component	Statement of agreement	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree	$\bar{x}$ (SE)[1]
Attitude	Workshops and field days are a good way for ranchers to learn how to conduct wildlife their ranch.[2]	16 (2)	22 (2)	279 (26)	683 (63)	93 (9)	3.8 (0.0)
	If I attend wildlife workshops, I will be able to conduct wildlife management on my ranch.[3]	39 (4)	112 (10)	566 (52)	338 (31)	38 (4)	3.2 (0.0)
Subjective norm	My family encourages people like me to attend technical field days and workshops.[4]	76 (7)	286 (26)	584 (53)	135 (12)	12 (1)	2.7 (0.0)
	The opinions of my family matter to me.[5]	4 (0)	6 (1)	98 (9)	661 (61)	324 (30)	4.2 (0.0)
	My friends and neighbors encourage people like me to attend technical field days and workshops.[4]	88 (8)	338 (31)	540 (49)	118 (11)	9 (1)	2.7 (0.0)
	My friends' and neighbors' views matter to me.[5]	21 (2)	45 (4)	308 (28)	595 (54)	124 (11)	3.7 (0.0)
	Other ranchers encourage people like me to attend technical field days and workshops.[4]	78 (7)	315 (29)	538 (49)	153 (14)	9 (1)	2.7 (0.0)
	The approval of fellow ranchers matters to me.[5]	16 (2)	38 (4)	330 (30)	580 (53)	129 (12)	3.7 (0.0)
	State and federal agency staff (e.g., extension agents, US Department of Agriculture, Farm Service Agency, Natural Resources Conservation Service, wildlife and natural resource departments, state foresters, etc.) encourage ranchers to attend technical field days and workshops.[4]	49 (5)	152 (14)	455 (42)	402 (37)	35 (3)	3.2 (0.0)
	Agency staff opinions matter to me.[5]	26 (2)	51 (5)	377 (35)	552 (51)	87 (8)	3.6 (0.0)
Perceived behavioral control	State and federal agencies make announcements to ranchers about wildlife workshops.[6]	34 (3)	154 (14)	501 (46)	369 (34)	35 (3)	3.2 (0.0)
	Because I receive announcements about wildlife workshops, I am able to attend them.[7]	73 (7)	290 (27)	537 (49)	177 (16)	16 (2)	2.8 (0.0)
	Generally, ranches are suitable for wildlife management.[6]	17 (2)	53 (5)	294 (27)	651 (60)	78 (7)	3.7 (0.0)
	Because my ranch is suitable for wildlife management, I attend workshops.[7]	60 (6)	204 (19)	507 (46)	281 (26)	41 (4)	3.0 (0.0)
	Generally, ranchers are knowledgeable about wildlife management.[6]	24 (2)	111 (10)	420 (38)	489 (45)	49 (5)	3.4 (0.0)
	Because I already know enough about wildlife management, I do not attend workshops.[7,8]	71 (7)	408 (37)	467 (43)	128 (12)	19 (2)	2.6 (0.0)

[1]SE=0.0 were <0.1.
[2]Attitudinal strength.
[3]Outcome evaluation.
[4]Normative belief.
[5]Motivation to comply.
[6]Control belief.
[7]Control power.
[8]Reverse-coded before regression analyses.

(USDA 2009). Principal components factor analysis and Cronbach's α were used to assess construct validity and reliability of latent variables (Stenson and Wilkinson 2007; Vaske 2008). Factor scores from the workshop behavioral intent variable were used as the response variable regression models. Explanatory variables for attitude, subjective norm, and perceived behavioral control were calculated with multiplicative and summated scales using TPB protocols (Ajzen 1988). We used multiple regression to determine relationships between behavioral intent (response variable) and the explanatory variables. Multicollinearity was checked with Pearson correlations and variance inflation factor (Agresti and Finlay 1997; Vaske 2008). We concluded statistical significance at $P=0.05$. Data were tested for normality and homogeneity of variance, and those violating test assumptions were rank-transformed prior to analysis (Conover 1980).

RESULTS

Response, Sociodemographics, and Ranch Characteristics

Of the 2 771 surveys mailed, 1 634 ranchers responded, resulting in the following adjusted response rates: overall=59%, Alabama=57%, Florida=72%, Georgia=49%, and Mississippi=56% (discounting undeliverable surveys). After accounting for those surveys returned blank or respondents answering "no" to the screening question, indicating they were no longer active ranchers, we had 1 093 usable surveys. Before maximum likelihood imputations, item nonresponse

ranged from 3% to 6% per variable. We tested our results with comparable state-level data from the 2007 Census of Agriculture (USDA 2009) on equivalent demographic (i.e., gender, age, and ethnic group) and ranch size variables, and found error. Our responses had fewer ranchers under 35 yr old ($G=80.73$, df=8, $n=69\,008$, $P<0.001$) and fewer ranches smaller than 57 ha ($G=1\,443.69$, df=11, $n=68\,566$, $P<0.001$) than the 2007 Census of Agriculture. We found no differences in any other comparisons. Therefore, the data best reflect the perceptions of producers ≥ 35 yr old and those that have ranches ≥ 57 ha.

Respondents were 87% male, 96% white, and averaged 61.0 ± 0.4 ($\bar{x} \pm SE$) yr old. They owned and leased 597.7 ± 43.5 ha, owned properties for 52.5 ± 1.2 yr, managed 110.2 ± 12.3 cattle, and had raised cattle on their current property for 43.5 ± 1.0 yr. Forty percent graduated from college with at least an associate's degree, 23% had some college courses, 32% graduated from high school, and 6% had less than a high school diploma. Five percent of ranchers reported household incomes > $200 000, 3% at $150 000–199 000, 15% at $100 000–149 000, 41% at $50 000–-99 000, 25% at $25 000–49 000; and 11% at $0–24 999. Twenty-three percent of ranchers had previously participated in technical workshops or field days that included wildlife topics.

TPB Analyses

Behavioral Intent. Respondent likelihood to participate in a variety of potential workshop or field day topics averaged 2.7 ± 0.0 (five-point scale from 1=very unlikely to 5=very likely; Table 1). Ranchers indicated they were likely or very likely to participate in grazing systems management workshops for both wildlife and cattle more than any other topic (49% compared to 21–36% for all other topics). Ranchers were very unlikely or unlikely to participate in wildlife enterprise workshops or field days (57%) more often than any other topic (28–48%). Responses factored into one variable explaining 70% of the variance with a Cronbach's $\alpha=0.925$, indicating a valid and reliable construct.

Attitude. Attitude was measured with a single pair of statements measuring the outcome evaluation and attitudinal strength (Table 2). Most ranchers agreed or strongly agreed that workshops were a good way for ranchers to learn about wildlife management (72%). However, they were less certain of workshop outcomes, with 52% indicating they neither agreed nor disagreed that they would be able to conduct wildlife management on their ranches if they attended workshops or field days.

Subjective Norm. Subjective norm was measured with a series of four paired belief and motivation-to-comply statements (Table 2). Most ranchers indicated they neither agreed nor disagreed with statements that important social groups encouraged them to attend wildlife workshops and field days (42–53%). However, they considered the opinions of those groups important to them, with 59–91% agreeing or strongly agreeing with statements measuring motivation to comply. The paired belief and motivation to comply statements factored together among the four pairs, explaining 74% of the total variance and had a Cronbach's $\alpha=0.88$, indicating adequate construct validity and reliability.

Perceived Behavioral Control. Perceived behavioral control was measured with a series of three paired control belief and power statements (Table 2). Ranchers believed that ranches are suitable for wildlife and ranchers are knowledgeable about wildlife management (67% and 50% agreed or strongly agreed with statements). However, they were uncertain as to whether agencies made announcements to ranchers about wildlife workshops (49% neither disagreed nor agreed). Ranchers were similarly uncertain for two corresponding control power statements regarding whether receiving announcements or the suitability of their ranch for wildlife management enabled their participation in wildlife workshops or field days (49% and 46% neither disagreed nor agreed with statements, respectively). However, they did not perceive that sufficient prior knowledge of wildlife management dissuaded them from attending workshops or field days (44% either disagreed or strongly disagreed with the statement). The paired control belief and power statements factored together among the three pairs accounting for 57% of the variance and had a Cronbach's $\alpha=0.63$. It is unclear if a lower Cronbach's α is a function of relatively few—in our case, three—measures. However, our α value is close to 0.65, which is commonly accepted as adequate reliability in similar research (Vaske 2008).

Main Analysis. All explanatory variables were significant, explaining 41% of the total variance in predicting rancher intent to participate in wildlife workshops and field days (Table 3). Perceived behavioral control and subjective norm exhibited similar and stronger standardized effects on the response variable than attitude.

DISCUSSION

With less than one-fourth of ranchers reporting that they had participated in a wildlife technical workshop and field day in the past, there is clear indication that participation can be improved. In turn, if ranchers adopt behaviors resultant of those trainings, technical assistance and wildlife conservation can potentially affect greater proportions of ranches and total acres. The first step in increasing participation is to understand why ranchers are or are not attending technical workshops and field days. Agencies and other wildlife conservation practitioners can then improve program content, delivery, and logistics to encourage higher participation, while retaining past participants. By systematically employing a well-accepted behavior change model, TBP, to predict participation, we can provide specific recommendations to address wildlife workshop and field day participation based on key predictor variable components.

TPB provided a significant model that explained a good proportion of the variance for behavioral intent to participate

Table 3. Multiple regression model (adjusted $R^2=0.412$) explaining how likely cattle ranchers ($n=1\,093$) were to participate in wildlife management workshops and field days using the theory of planned behavior in the southeastern United States, 2009.

Theory component	*SE*	β	*t*	*P*
Attitude	0.028	0.127	4.601	<0.001
Subjective norm	0.028	0.316	11.218	<0.001
Perceived behavioral control	0.030	0.329	11.076	<0.001

in wildlife technical workshops and field days. As ranchers were considerably more interested in workshops or field days that covered grazing systems management for both wildlife and cattle than any other topic, it gives agencies a clear indication of their preferred subject matter. Initially focusing on favored topics may be a good way to attract new participants. Once ranchers have participated in a workshop and field day, facilitated brainstorming and ranking exercises, as well as workshop and field day evaluations, could be employed to prioritize future topics of interest.

Perceived behavioral control variables had the strongest influence on behavioral intent. This suggests several potential improvements could be made to workshop and field day advertising and messaging. With the majority of respondents indicating they were uncertain if agencies announced workshops and field days and if announcements would influence their attendance, there is a clear need to increase and diversify how workshops and field days are advertised and promoted. Prior research on communication channels indicated ranchers located in one part of our study area employ a variety of media to obtain technical information (Vergot et al. 2005). It is therefore likely a mixed approach to advertising workshops and field days would be most effective. This approach could include printed and mailed, radio, email, and Internet announcements, as well as interpersonal face-to-face or telephone communications. It may be particularly effective to ask individuals of social groups important to ranchers identified by our subjective norm motivation-to-comply variables (family members, friends and neighbors, fellow ranchers, and trusted agency staff) to assist with advertising and promotion.

In another perceived behavioral control construct component, respondents indicated that in general, ranchers were knowledgeable about wildlife management. However, the paired control belief did not suggest ranchers would not attend wildlife workshops and field days if they felt they already knew enough about wildlife. This should be reassuring to practitioners, as ranchers' knowledge does not appear to preclude their participation in workshops and field days. According to Roger's (2003) diffusion of innovations theory, if these knowledgeable ranchers were also opinion leaders, they could be used to potentially increase workshop and field day participation. Wildlife-knowledgeable opinion leaders could be incorporated into the workshop or field day programs by taking lead roles as organizers, presenters, or demonstrators. Formal identification of wildlife-knowledgeable opinion leaders through key informants and training opinion leaders in effective outreach and extension methods will likely make these methods more effective (Rogers 2003).

Subjective norm was nearly as influential as perceived behavioral control on rancher intention to participate in wildlife workshops and field days. We found no clear trends among the subjective norm groups measured (families, friends and neighbors, fellow ranchers, or state and federal agency staff) that they exert more or less social pressure on ranchers to attend wildlife workshops and field days. Most ranchers were undecided in their beliefs that these social groups encouraged them to participate. However, motivation to comply—how influential these groups are on landowners—was strong for all groups. Coupled with our results from perceived behavioral control, using these influential groups to advertise and promote wildlife workshops and field days may increase participation. According to community-based social marketing, a proven method to encourage behavior is to ask for verbal or written commitments (McKenzie-Mohr and Smith 1999). Workshop and field day organizers could contact previously identified key opinion leaders in each subjective norm group, asking them to commit to attending the workshop and field day. Once participation is confirmed, the organizer can then ask those opinion leaders to commit to personally inviting several other members of their social group to attend. This action could be further incentivized if the organizer offered a gift to opinion leaders whose efforts result in a predefined number of participants attending. Ultimately, workshop organizers could effectively employ subjective norms to increase participation if potential participants feel that groups and people important to them would approve if they attended and disapprove if they did not (Fishbein and Ajzen 1975; Bator and Cialdini 2000).

The final TPB component, attitude, although significant, was less influential on behavioral intent than perceived behavioral control and subjective norm. It is likely less predictive as nearly three-fourths of respondents agreed or strongly agreed with the attitudinal strength variable that workshops and field days are a good way for ranchers to learn how to conduct wildlife management on their ranches. Therefore, other items, in our case perceived behavioral control and subjective norm constructs, were better predictors. We do not trivialize attitudes, as they are usually the strongest predictor of behavioral intent in TPB studies (Fishbein and Ajzen 1975; Armitage and Conner 2001; Manfredo 2008,). Moreover, we discovered strong attitude effects in TPB research with this same sample of ranchers when we studied behaviors related to the integration of wildlife management into cattle ranching activities (Willcox et al. 2012). However, practicably, in this case, due to the lower effect, improving the strength of ranchers' positive attitude toward wildlife workshops and field days should not yield as much behavior change since most ranchers already believe that these activities are a good way to learn about wildlife management. Workshop and field day organizers could potentially increase attendance by addressing the outcome evaluation component of the attitude variable. In the outcome evaluation question, ranchers were undecided as to whether or not their attendance at wildlife workshops and field days would enable them to conduct wildlife management on their ranch. Emphasizing practical workshop and field day activities and topics that would empower ranchers to conduct wildlife management in advertisements and promotions could potentially increase participation in them.

IMPLICATIONS

Federal financial support for wildlife conservation through legislation such as the Farm Bill, may have reached a plateau or may decline in the near future. As enrollment and acreage caps of cost-share financial assistance programs may decrease, wildlife technical assistance programs workshops and field days may become increasingly important conservation program tools. Maximizing participation in these programs will be critical to positively affect wildlife conservation over the greatest number of ranches and acres. As our study demonstrated, by better understanding participation using predictive

behavior models, conservation agency staff can target specific aspects of workshop and field days as they advertise and promote them, ultimately increasing participation. TPB proved a useful model to predict rancher participation in technical workshops and field days. However, further analysis of the individual theory constructs—attitudes, subjective norms, and perceived behavioral control—can give practitioners direct insight on how programs can be improved. TPB is but one social psychology model available to conservation practitioners seeking to improve behavior change programs. We recommend carefully selecting an appropriate model and then conducting an elicitation study to develop robust and meaningful survey items and constructs, which will ultimately yield data targeted to maximize behavior change program effectiveness.

ACKNOWLEDGMENTS

We thank all the ranchers and agency personnel who participated in interviews, reviewed survey drafts, and responded to our survey. We appreciate the efforts of Jim Selph, who arranged many of our rancher interviews, and Dixie Cline, who accurately entered our data. Martha Monroe, Perran Ross, Glenn Israel, Scott Sanders, and Emma Willcox assisted us greatly by reviewing survey drafts and earlier versions of this manuscript. The University of Florida Institutional Review Board 02 approved our TPB elicitation study interview questions, survey questions, and survey administration methods.

LITERATURE CITED

Agresti, A., and B. Finlay. 1997. Statistical methods for the social sciences. Upper Saddle River, NJ, USA: Prentice Hall. 706 p.

Ajzen, I. 1988. Attitudes, personality, and behavior. Chicago, IL, USA: The Dorsey Press. 175 p.

Ajzen, I. 2011. The theory of planned behavior: reactions and reflections. *Psychology and Health* 26:1113–1127.

Armitage, C. J., and M. Conner. 2001. Efficacy of the theory of planned behaviors: a meta-analytic review. *British Journal of Social Psychology* 40:471–499.

Bator, R. J., and R. B. Cialdini. 2000. The application of persuasion theory to the development of effective proenvironmental public service announcements. *Journal of Social Issues* 56:527–541.

Brain, R. G., M. E. Hostetler, and T. Irani. 2014. Why do cattle ranchers participate in conservation easement agreements? Key motivators in decision making. *Agroecology and Sustainable Food Systems* 38:299–316.

Cattaneo, A. 2003. The pursuit of efficiency and its unintended consequences: contract withdrawals in the environmental quality incentives program. *Review of Agricultural Economics* 25:449–469.

Center for Environmental Cooperation. 1997. Ecological regions of North America: toward a common perspective. Montreal, Canada: CEC Secretariat. 54 p.

Claassen, R., A. Cattaneo, and R. Johansson. 2008. Cost-effective design of agri-environmental payment programs: US experience in theory and practice. *Ecological Economics* 65:737–752.

Clouser, R. L., R. Muraro, and L. Racevskis. 2007. 2006 Florida land value survey. Gainesville, FL, USA. University of Florida, Electronic Data Information Source. 5 p.

Conner, M., and Armitage, C. J. 1998. Extending the theory of planned behavior: a review and avenues for further research. *Journal of Applied Social Psychology* 28:1429–1464.

Conover, W. J. 1980. Practical nonparametric statistics. New York, NY, USA: John Wiley and Sons. 493 p.

Dillman, D. A., J. D. Smyth, and L. M. Christian. 2008. Internet, mail, and mixed-mode surveys: the tailored design method. New York, NY, USA: John Wiley and Sons. 512 p.

Fishbein, M., and I. Ajzen. 1975. Belief, attitude, intention, and behavior: an introduction to theory and research. Reading, MA, USA: Addison-Wesley Publishing. 480 p.

Fishbein, M., and I. Ajzen. 2010. Predicting and changing behavior: the reasoned action approach. Hove, NY, USA: Taylor and Francis. 518 p.

Francis, J. J., M. P. Eccles, M. Johnston, A. Walker, J. Grimshaw, R. For, E. F. S. Kaner, L. Smith, and D. Bonetti. 2004. Constructing questionnaires based on the theory of planned behavior: a manual for health services researchers. Newcastle Upon Tyne, UK: University of Newcastle, Center for Health Services Research. 42 p.

Haufler, J. B., and A. C. Ganguli. 2007. Benefits of Farm Bill grassland conservation practices to wildlife. *In:* J. B. Haufler [ed.]. Fish and wildlife response to Farm Bill conservation practices. Bethesda, MD, USA: The Wildlife Society. p 57–69.

Hrubes, D., I. Ajzen, and J. Daigle. 2001. Predicting hunting intentions and behavior: an application of the theory of planned behavior. *Leisure Sciences* 23:165–178.

Lambert, D., P. Sullivan, R. Claassen, and L. Foreman. 2006. Conservation compatible practices and programs: who participates? Washington DC, USA: US Department of Agriculture. Economic Research Report ERR-14. 48 p.

Manfredo, M. J. 2008. Who cares about wildlife? New York, NY, USA: Springer. 228 p.

Martin, S. R., and K. McCurdy. 2009. Wilderness food storage in Yosemite: using the theory of planned behavior to understand backpacker canister use. *Human Dimensions of Wildlife* 14:206–218.

McKenzie-Mohr, D., and W. Smith. 1999. Fostering sustainable behavior: an introduction to community-based social marketing. Gabriola Island, British Columbia, Canada: New Society Publishers. 176 p.

National Wildlife Federation. 2014. 2014 Farm Bill conference report analysis. Available at: http://www.nwf.org/~/media/PDFs/wildlife/farm%20%20bill/NWF-2014-Farm-Bill-Analysis_final.pdf. Accessed 19 March 2014.

[NRCS] Natural Resources Conservation Service. 2013a. Environmental Quality Incentives Program. Available at: http://www.nrcs.usda.gov/programs/eqip/. Accessed 26 July 2013.

[NRCS] Natural Resources Conservation Service. 2013b. Wildlife Habitat Incentives Program. Available at: http://www.nrcs.usda.gov/programs/whip/. Accessed 26 July 2013.

Rogers, E. M. 2003. Diffusion of innovations. New York, NY, USA: Simon & Schuster. 576 p.

Rossi, A. N., and J. B. Armstrong. 1999. Theory of reasoned action vs. theory of planned behavior: testing the suitability and sufficiency of a popular behavioral model using hunting intentions. *Human Dimensions of Wildlife* 4:40–56.

Schafer, J. L., and J. W. Graham. 2002. Missing data: our view of the state of the art. *Psychological Methods* 7:147–177.

Stenson, H., and Wilkinson, L. 2007. Factor analysis. *In:* SYSTAT [ed.]. SYSTAT 12 statistics I. San Jose, CA, USA: SYSTAT Software, Inc. p. 452–493.

Stubbs, M. 2010. Technical assistance for agriculture conservation. Washington, DC, USA: Congressional Research Service. CRS Report for Congress RL34069 7–5700. 29 p.

US House of Representatives 113th Congress. 2014. H.R. 2642. Agricultural Act of 2014. Washington DC, USA: Government Printing Office. 357 p.

[USDA] US Department of Agriculture. 2009. 2007 Census of agriculture. Washington, DC, USA: United States Department of Agriculture. Report AC-07-A-51. 639 p.

Vaske, J. J. 2008. Survey research and analysis: applications in parks, recreation, and human dimensions. State College, PA, USA: Venture Publishing, Inc. 635 p.

Vergot, P., III, G. Israel, and D. E. Mayo. 2005. Sources and channels of information used by beef cattle producers in 12 counties of the Northwest Florida Extension District. *Journal of Extension* 43:2RIB6.

Willcox, A. S., W. M. Giuliano, and G. D. Israel. 2010a. Effects of token financial incentives on response rates and item nonresponse for mail surveys. *Human Dimensions of Wildlife* 15:288–295.

Willcox, A. S., W. M. Giuliano, and M. C. Monroe. 2012. Predicting cattle rancher wildlife management activites: an application of the theory of planned behavior. *Human Dimesnions of Wildlife* 17:159–173.

Willcox, A. S., W. M. Giuliano, C. Wynn, and J. S. Sanders. 2010b. Wildlife management on private lands in Florida. *Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies* 63:27–34.