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Original Article

Private Landowner Interest in Market-Based Incentive Programs for Endangered Species Habitat Conservation

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ABSTRACT More than 75% of endangered species in the United States rely on private lands for habitat. Although this habitat has long been regulated under the Endangered Species Act, there is now broad agreement that economic incentives are also needed for effective protection on private land. Many different mechanisms for incentive programs have been proposed and tested. For example, recovery credit systems use term-duration market-based contracts to engage landowners in endangered species conservation. We examined how market-mechanism design influences interest in endangered species habitat conservation using a survey of North Carolina Farm Bureau county advisory board members in 93 of the 100 North Carolina counties ($n = 735$) in 2009. Respondents preferred contracts (57% were interested) over easements (39% were interested). Endangered species conservation ranked low in importance relative to other conservation issues, but 45% of respondents were interested in contracts to conserve endangered species habitat on their property. The preferred contract duration was 10 years, and respondents preferred state- and agricultural-related organizations over federal and wildlife conservation-related organizations for managing contracts. Younger respondents, respondents who had previously participated in conservation programs, respondents who perceived endangered species conservation as important, and respondents who had lower property-rights orientation scores, were most likely to be interested in contracts to restore and maintain endangered species habitat on their lands. Our results suggest that market mechanisms could drive down costs and drive up durations for endangered species habitat conservation contracts. Further, term contracts may prove critical for endangered species conservation efforts that require high levels of landowner support and spatial flexibility within relatively short-time frames. © 2012 The Wildlife Society.

KEY WORDS contracts, easements, endangered species, market-based incentives, North Carolina, participation, private land, recovery credit system.

In the United States [US], >60% of the land is privately owned. Although efforts to conserve endangered species in the US have historically focused on public lands (Knight 1999, Male 2005), >75% of endangered species rely on private lands for habitat (Lockwood 1998, Turner and Rylander 1998). Wilcove et al. (1998) noted that conversion of land to development was responsible for harming hundreds of threatened and endangered species. Similarly, human population growth and suburban sprawl have led to a loss of wildlife habitat and an increase in number of species considered to be rare, threatened, and endangered (Peterson et al. 2007).

Conservation challenges posed by population growth and development are compounded by disincentives associated with the Endangered Species Act [ESA] of 1973 (Brook et al. 2003). Despite its achievements, many have criticized ESA restrictions on private lands (Sax 1997), especially when the endangered species in question is not in residence (Raymond and Olive 2008). Critics suggest the ESA generates an anti-conservation attitude among private landowners and leads some landowners to take preemptive actions against endangered species to avoid potential regulation (Wilcove et al. 1996, Innes et al. 1998, Bonnie 1999, Main et al. 1999, Bean 2002). For instance, Lueck and Michael (2003) found North Carolina [NC] landowners whose lands were closer to red-cockaded woodpecker (*Picoides borealis*) populations used shorter growth rotations and prematurely harvested trees more often than other landowners, thus preventing red-cockaded woodpeckers from occupying their lands.

Efforts to reduce the ESA's disincentives include: 1) increasing land-use flexibility, 2) providing economic

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incentives (paying landowners to manage land in ways that benefit wildlife), and 3) providing conservation markets (mechanisms that facilitate commerce in endangered species habitat). The U.S. Congress attempted to increase land-use flexibility by amending the ESA in 1982 to authorize the U.S. Fish and Wildlife Service [FWS] to grant incidental take permits. An incidental take permit allows private, non-federal entities to conduct otherwise prohibited activities on private land that might result in the taking of a protected species if take is minimized and mitigated. Efforts to remove disincentives were extended in 1999 with the adoption of Safe Harbor Agreements in which landowners agree to manage their land for the benefit of endangered species in exchange for assurance that their voluntary management actions will not result in additional regulatory restrictions.

The FWS' Landowner Incentive Program typifies an economic incentive program for endangered species conservation on private lands (U.S. Fish and Wildlife Service 2011). In this program, the FWS provides funding to state wildlife agencies that, in turn, pay private landowners to create and improve habitat for at-risk species. This type of program typically uses short-term contracts that include annual incentive payments and technical assistance. Such programs can be improved by including collaborative processes rooted in local social norms (Sorice et al. 2011).

Habitat Conservation Banking represents a market-based incentive approach to endangered species conservation on private lands with permanent habitat protection. In its current format, Habitat Conservation Banking allows landowners, who would like to conduct activities harmful to a given species habitat, to purchase credits from other landowners (i.e., bankers) who have either conserved or restored habitat for that species elsewhere using a permanent easement (Bonnie 1999). Conservation banking, however, has been shown to reduce the pressure on landowners and developers to avoid harm to existing habitat (Roberts 1993). It has also been suggested that banks offer little to recovery efforts because they fail to fulfill the same ecological functions of the impact areas they are replacing (Roberts 1993, Bonnie 1999), and that the high cost of restoring some habitats can result in the bank itself being cost-prohibitive.

The Recovery Credit System [RCS] represents another market-based incentive approach for promoting endangered species habitat conservation on private lands, which can be distinguished from conservation banking by using landowner contracts in lieu of permanent easements. The RCS allows contract funders to exchange credits, purchased from private landowners, to offset temporary habitat damage. Because RCS utilizes contract law, implementation is faster and less difficult than for programs involving liens on property deeds, making rapid response to landscape change associated with climate change or urban sprawl more feasible. Programs rooted in the RCS concept have been developed for golden-cheeked warbler (*Dendroica chrysoparia*; Wilkins et al. 2008), prairie dog (*Cynomys parvidens*), gopher tortoise (*Gopherus polyphemus*), and sage grouse (*Centrocercus urophasianus*).

The emergence of market-based conservation programs for rare, threatened, or endangered species, particularly those based on contracts, makes questions about landowner preferences for contracts over easements more important. Kramer and Jenkins' (2009) study of Eastern NC farmers found that 46% of farmers in Bertie County, a control county, were interested in payments for ecosystem services programs that emphasize wildlife conservation, while only 13% of landowners in a 5-county Red Wolf Recovery Program area indicated an interest. They also found that contract length and program administration by a conservation organization were negatively correlated to willingness to participate in a proposed payment for ecosystem services program.

We contribute to this literature with a case study of North Carolina Farm Bureau [NCFB] county advisory board members. Our study objectives were to 1) determine respondent views on the relative importance of endangered species conservation; 2) compare respondent interest in conservation easements versus contracts; 3) gauge respondent interest in a contract to restore and maintain endangered species habitat on their land; 4) assess respondent preferences for contract and easement durations, enrollment acreage, and managing organizations; and 5) determine what variables (socio-demographic, land characteristics, perceptions, and experiences) predict interest in endangered species habitat conservation contracts. NC provides a good case study because 80% of NC is privately owned (NC Wildlife Resources Commission 2005), and rapid population growth and suburban sprawl threatens wildlife habitat, environmental health, farm lands, and rural economies. Private landowners, therefore, play a critical role in determining the fate of NC's rare, threatened, and endangered species.

METHODS

To better understand interest in incentive programs and preferences across program attributes, we conducted a survey of NCFB county advisory board members in all 100 counties in NC. County advisory board members represent farming landowners in the state, and are elected by NCFB members, who accounted for 86% of all owners of farm land in NC at the time of this study (C. Lowder, NCFB, personal communication). Accordingly, this purposive sample targeted elected representatives of owners of farm lands in NC who were actively engaged in both state-level policy-making related to farm lands and responses to federal policies addressing the same suite of issues. Thus, the sample literally represented farm landowners, rather than representing them demographically. This approach provided the valuable ability to evaluate views among specific landowners who determine the direction of farm land policy in NC. However, this approach is limited in that we cannot draw inference about the opinions of average owners of farm lands. A questionnaire was administered in person to NCFB county advisory board members by NCFB staff or the principal investigator between March and October 2009. We promoted design validity with reviews by experts from NC State University and the NC Cooperative Extension, and by using a pretest involving interviews with landowners in 7 counties in NC ($n = 61$).

We asked several questions about the respondent's land characteristics: total number of acres owned in NC, acreage of their largest tract of NC property, how long this largest tract of property had been in their extended family, percent of income generated from their land, and whether they had participated in programs that paid them for land conservation in the past 5 years and, if so, which program(s) they participated in. We also collected socio-demographic data for: gender, race, marital status, primary occupation, highest level of education completed, year of birth, and 2008 gross total household income level. We also asked respondents: "What plans do you have for your property upon your death?" Answer options included the following: 1) transfer it to relatives, 2) sell it, 3) donate it to a land trust, and 4) unsure. For the purposes of analysis, we created a binary variable to indicate whether respondents planned to transfer their land to relatives. We addressed objective 1 by asking respondents to estimate the importance of conservation of endangered species, game species, open space, soil, and wetlands using a 7-point Likert scale, where 1 = not important at all, 4 = neutral, and 7 = extremely important.

We compared landowner interest in conservation easements and contracts (objective 2) by asking respondents whether they would apply for them. We gave respondents a brief definition of a conservation easement ("In a conservation easement, a landowner sells development rights for their property. This creates a legally enforceable agreement between the landowner and the easement holder that restricts real-estate development for the length of the easement. Landowners cannot remove the development restrictions from their property deed."), and then asked: "Would you place your property in a conservation easement?" Subsequently, we asked respondents to indicate what easement lengths they would consider (1, 5, 10, 15, 20, 25, 30, and 50 years, and permanent), and how many acres they would consider placing in the easement. Next, we gave respondents a brief definition of a conservation contract ("In a conservation contract, a landowner agrees to implement specific conservation actions on their property in return for payment. Landowners can choose to terminate the contract at any time by returning all payment."), which differed from a conservation easement in 2 key ways: 1) legal basis of the agreement (contract law instead of property law); and 2) agreement termination process (the return of all payments to terminate a contract versus not allowing termination of an easement). To assess interest in conservation contracts, we asked respondents: "Would you apply for a conservation contract to restrict real-estate development on your property?" As with the easement, we asked respondents to indicate their preference for contract lengths and how many acres they would consider placing in the contract. Additionally, we asked respondents to indicate the extent to which they agreed or disagreed that several organizations would be best to oversee the contract (7-point Likert scale where 1 = strongly disagree, 4 = neutral, and 7 = strongly agree; objective 4). We chose organizations to include one agriculture-related and one wildlife-related agency from state and federal governments and nonprofit organizations in NC: NC Cooperative Extension, U.S. Department of Agriculture [USDA], NC Wildlife Resources Commission, FWS, NCFB, and The Nature Conservancy, respectively.

We used the same approach to gauge respondent interest in a conservation contract to restore and maintain endangered species habitat (objective 3), but we changed the conservation action from restricting real-estate development to restoring and maintaining endangered species habitat. We asked: "Would you apply for a conservation contract that paid you to restore and maintain habitat for endangered species on your property?" and asked respondents to indicate their preferences for contract duration, acreage enrollment, and managing organizations (objective 4). The question of whether respondents would apply for an endangered species habitat conservation contract served as our dependent variable in the model identifying predictors of interest in this type of contract (objective 5). We examined factors influencing interest by using multiple logistic regression. We attempted to predict landowner interest in an endangered species habitat conservation contract using 6 independent variables: total ACRES OWNED in NC; total household INCOME; AGE; PAST PARTICIPATION in conservation programs; property-rights orientation [PRO] (Jackson-Smith et al. 2005); and IMPORTANCE of endangered species conservation.

We hypothesized a positive relationship between ACRES OWNED and interest in an endangered species habitat conservation contract. Due to economies of scale, large properties may be more likely to qualify for programs and landowners with larger land holdings may make a greater effort to participate in incentive programs when more acreage is at stake. These landowners may also be in a better position to invest in their property, and more able to afford program-related cost-share requirements (Gan et al. 2005). We hypothesized that INCOME would be positively correlated with interest in endangered species habitat conservation contracts because wealthier landowners are more likely to be able to afford costs associated with incentive programs (Arano et al. 2004) and better able to access program information sources (Nagubadi et al. 1996). AGE was hypothesized to be negatively related to interest in an endangered species habitat conservation contact because older landowners may be less inclined to place their property in conservation programs (Langpap 2004). Further, older landowners might believe it would be more difficult to sell enrolled land or transfer it to the next generation (Esseks and Kraft 1986). PAST PARTICIPATION was hypothesized to be positively correlated with interest in endangered species habitat conservation contracts because landowners who have previously participated in other programs were already familiar with the general format of conservation programs. Also, positive experiences with participation in one incentive program may encourage participation in other programs (Gan et al. 2005), and landowners are more likely to receive information about new programs in their dealings with program managers (Kauneckis and York 2009).

We measured property-rights orientations using a scale from Jackson-Smith et al. (2005). The scale was designed

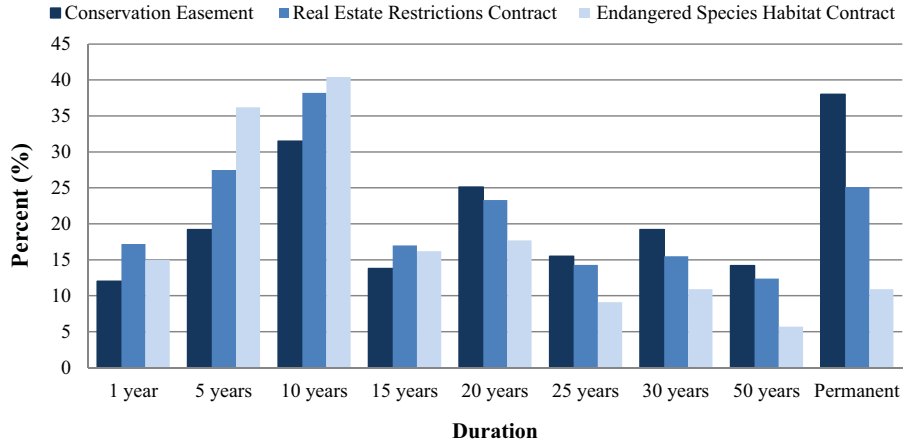

Figure 1. Percent (%) interest in conservation easements, conservation contracts to restrict real-estate development, and conservation contracts to restore and maintain endangered species habitat among North Carolina Farm Bureau county advisory board members in 93 North Carolina counties, USA (Mar–Oct 2009).

to measure individual rights and social responsibility value orientations. Conserving habitat for endangered species provides a social benefit; therefore, we hypothesized that landowners whose property-rights orientations scores leaned toward social responsibility would be more likely to be interested in this type of contract than those with individual rights value orientations who might fear the loss of their property rights associated with a contract (Jackson-Smith et al. 2005). We hypothesized that those who ranked the IMPORTANCE of endangered species conservation high would be more interested in a contract to conserve habitat for endangered species than those who rank IMPORTANCE low. We used the Statistical Package for Social Sciences 17.0.0 (SPSS 2008) to calculate all means, measures of variance, and regression statistics (Vaske 2008).

RESULTS

In total, 735 county advisory board members participated in the study, resulting in a 78.3% compliance rate. Seven county boards (Camden, Cherokee, Chowan, Durham, Graham, Lee, Madison) refused to participate in the study at the board level, and were not included in the overall compliance rate. Mean respondent age was 59 (SD = 12.88), and most respondents were male (93.2%), white (96.4%), and married (88.3%). Over half of respondents had some college-level education (58.2%) and worked primarily in a farming–agricultural-related industry (77.3%). Median household income was US$87,500 (SD = $53,467). The median total acreage owned in NC was 150 (SD = 359.97). The median acreage of the largest tract of land owned in NC was 97 acres (SD = 272.24), and this largest property had been in the respondents' extended family for an average of 64 years (SD = 55.21). Respondents earned an average of 56.9% of their total household income from activities on their land. Most respondents (76.2%) indicated that they planned to own their property for ≥25 years, or would maintain it "forever," "until death," or "as long as possible." Ninety percent of respondents indicated that they would transfer their land to relatives upon their death, and 70.5% indicated that they had a will or living trust in place that described plans for their property.

Interest in conservation contracts to restrict real-estate development (56.6%) was higher than interest in conservation easements (38.6%). On average, respondents indicated they would place more of their land (144.6 acres; SD = 168.29; median = 93) in a conservation contract versus a conservation easement (133.8 acres; SD = 157.01; median = 80). A comparison of easement and contract duration preferences revealed a preference for shorter term conservation contracts and permanent easements (Fig. 1). The NCFB received the highest rating as an organization to oversee contracts to restrict real-estate development (Table 1).

Respondents rated endangered species conservation lowest in conservation importance ($\bar{x}$ = 4.0; SD = 1.71) relative to

Table 1. Average scores, with standard errors, for the extent to which respondents disagree or agree that 2 state, 2 federal, and 2 nonprofit organizations would be best to oversee conservation contracts using a 7-point Likert scale where 1 = strongly disagree and 7 = strongly agree, from a survey of North Carolina Farm Bureau county advisory board members in 93 North Carolina counties, USA (Mar–Oct 2009).

	Endangered species habitat conservation contracts		Real-estate restrictions contract	
Organization	**$\bar{x}$ Score**	**SE**	**$\bar{x}$ Score**	**SE**
North Carolina Cooperative Extension	4.41	0.105	4.73	0.093
U.S. Department of Agriculture	4.03	0.111	4.22	0.098
North Carolina Wildlife Resources Commission	4.53	0.109	3.47	0.090
U.S. Fish and Wildlife Service	3.78	0.117	2.97	0.091
North Carolina Farm Bureau	4.55	0.105	4.80	0.094
The Nature Conservancy	3.10	0.016	3.06	0.095

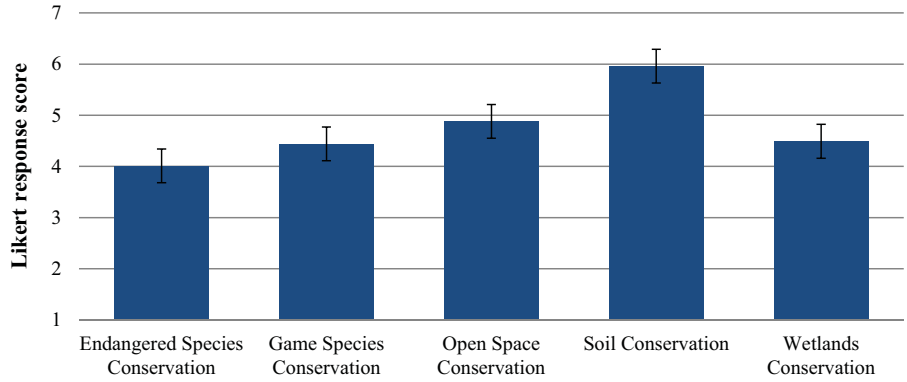

Figure 2. Importance of conservation objectives among North Carolina Farm Bureau county advisory board members in 93 North Carolina counties, USA (mean response, with standard errors, on a 7-point Likert scale where 1 = not important at all, 4 = neutral, and 7 = extremely important; Mar–Oct 2009).

game species, open space, soil, and wetlands conservation (Fig. 2). Less than half of respondents (45.1%) indicated that they would place their land in a contract to restore and maintain endangered species habitat. The average number of acres respondents indicated that they would place into such a contract was 91.2 acres (SD = 137.37; median = 50). The preferred duration for an endangered species habitat conservation contract was 10 years (Fig. 1). The NCFB and NC Wildlife Resource Commission received the highest ratings as organizations to oversee this type of contract, whereas The Nature Conservancy received the lowest ratings (Table 1).

PRO, PAST PARTICIPATION, IMPORTANCE, INCOME, and AGE predicted interest in a conservation contract to restore and maintain endangered species habitat (Table 2). PRO was negatively related to interest in the contract. The mean PRO score was 7.8 (SD = 6.89; min. = −21 [social responsibilities], max. = 21 [individual rights]). PAST PARTICIPATION in conservation programs and IMPORTANCE of endangered species conservation had positive relationships with interest in a contract. Over one-third of respondents (40.9%) indicated that they had participated in a land conservation program in the past 5 years, with the highest participation rates being in the Environmental Quality Incentive Program (36.0%), Conservation Reserve Program (CRP; 36.4%), and state agricultural cost-share programs for soil and water conservation (57.2%). Past participation in land conservation programs increased the odds of a landowner being interested in an endangered species habitat contract by 2.1. Similarly, the odds of respondents who ranked endangered species conservation high in importance being interested in endangered species habitat conservation contracts were 1.5 times higher than other respondents. Last, AGE was negatively related to interest in a contract for conserving endangered species habitat, whereas INCOME was positively related.

Table 2. Estimated coefficients, odds ratios, and standard errors of a model predicting respondent interest in endangered species habitat conservation contracts (n = 372) from a survey of North Carolina Farm Bureau county advisory board members from 93 North Carolina counties, USA (Mar–Oct 2009).

Variable	Coeff.	Odds ratio	SE
ACRES OWNED[a]	−0.012	0.988	0.041
PRO[b]	−0.044**	0.957	0.017
PAST PARTICIPATION[c]	0.762***	2.142	0.238
IMPORTANCE[d]	0.426***	1.531	0.074
INCOME[e]	0.004*	1.004	0.002
AGE	−0.209**	0.812	0.097
Constant	−2.238		
Nagelkerke R-squared[f]	0.215		

[a] Total number of acres owned in North Carolina/100.
[b] Property-Rights Orientation—scores ranged from −21 to 21, where −21 = social responsibility orientation and 21 = individual rights orientation.
[c] Participation in land conservation programs in the previous 5 years; Yes = 1 and No = 0.
[d] Importance of endangered species—7-point Likert-scale format where 1 = extremely unimportant and 7 = extremely important.
[e] 2008 gross total household income level in thousands of dollars (US$).
[f] Cameron and Windmeijer (1997).
* $P < 0.10$.
** $P < 0.05$.
*** $P < 0.01$.

DISCUSSION

Although previous research suggests landowners may take preemptive action against endangered species to avoid ESA-related land-use restrictions (Bonnie 1999, Main et al. 1999, Bean 2002, Brook et al. 2003, Lueck and Michael 2003), we found that nearly half of our respondents would promote endangered species habitat by applying for a contract to conserve endangered species habitat when they were given the opportunity to do so without facing economic disincentives. Our results suggest landowner interest in contracts for conserving endangered species habitat in NC is high enough that competition between landowners could drive down contract costs. Enrolling 45% of the 52,400 NC farm land operations (USDA National Agriculture Statistics Service 2010) in an endangered species habitat conservation contract at rates similar to those associated with the Wildlife Habitat Incentive Program (WHIP; US$37.17/acre), would cost approximately 224 times what is currently allocated for WHIP in NC (US$588,000; D. Riley, USDA—Natural Resources Conservation Service, personal communication). The use of a reverse auction format could allow program administrators to further capitalize on demands that exceed

supply. When this approach was used in the Fort Hood RCS, contract prices decreased and contract durations increased from 10 years for most contracts (the same duration preferred in this study) to 25 years once landowners realized longer durations increased chances of receiving a contract (B. Hayes, Texas A&M Institute of Renewable Natural Resources, personal communication).

The low importance attributed to endangered species conservation combined with landowners being more interested in real-estate restriction contracts than endangered species habitat contracts, suggests future conservation contracts aimed at wildlife conservation may be more effective if the contracts focus on protecting endangered ecosystems rather than endangered species. Our finding is supported by research from Kramer and Jenkins (2009), who found that farm operators in a Red Wolf Recovery Program area in Eastern NC showed significantly lower levels of interest in future payments for ecosystem services programs related to endangered species conservation than did operators in a non-Red Wolf Recovery Program county. The inclusion of Safe Harbor Agreements within an endangered species habitat conservation program might help to lessen landowner fears of ESA regulation by providing private landowners with the option of returning habitat to baseline conditions (Bonnie 1999).

Preference for contracts over easements may relate to respondent familiarity with contracts, and the average age of landowners in NC. Agricultural and forest landowners commonly participate in contracts for commodity production and land management programs. This familiarity may explain why respondents were more interested in contracts than easements. Most respondents intended to transfer their property to the next generation to use or sell as needed. Given that nearly half of our respondents were nearing or had passed retirement age (65 years old in the US), landowners may not view easements as a practical option for their land. Although easements do not prevent a landowner from transferring landownership, easements usually include a permanent deed restriction associated with sale of the property's development rights to another party (Lassner 1998); thus, easements can negatively affect economic returns (Main et al. 1999), property values, and the ability of the current or future landowner to sell the land (Stockford 1990). Short-term conservation contracts, therefore, may be a more favorable option for today's landowners needs because they do not involve deed restrictions and may have less of an impact on intergenerational land transfers.

Demographic changes in landownership associated with intergenerational land transfers (Best 2002) may suggest increased interest in conservation contracts for endangered species in the future. Interest in contracts for conserving endangered species habitat may increase as land transfers create a new generation of landowners in NC, because landowner age is negatively related to interest in conservation incentive programs to protect endangered species (Langpap 2004, this study). Furthermore, contracts for conserving endangered species habitat may provide enough incentive to encourage the next generation, who might prefer to sell inherited land, to maintain ownership while earning income from it, particularly when real-estate markets are depressed.

Our results suggest respondents trust state agencies and agricultural-related organizations over federal agencies and wildlife conservation-related organizations for managing conservation contracts. The nature of these relationships was clearly demonstrated by preferences for real-estate restriction contracts, where state agencies were preferred over federal agencies, and where agriculture groups were preferred over wildlife conservation groups. Relationships, however, were more complex for endangered species habitat conservation contracts, where only the preferences for state agencies over federal agencies persisted. Respondent recognition of wildlife-related subject expertise may explain why preferences for the NC Wildlife Resource Commission and FWS were higher for managing endangered species habitat contracts than for managing contracts protecting open space. Opposition to management by The Nature Conservancy in our findings supports previous research suggesting landowner opposition to "conservation organization" management, which could reflect their preferences for working with organizations they are more familiar or have previously worked with (Kramer and Jenkins 2009). Strong support for NCFB as a management organization suggests opposition to conservation organizations does not extend to agricultural organizations. Notably, NCFB is known to represent the interests of agricultural landowners and operators and therefore may be trusted by them.

Our findings provide the first empirical evidence (that we are aware of) to show a positive relationship between PRO and interest in an incentive program promoting endangered species conservation. Our findings build upon previous research that suggests property-rights orientations are a significant predictor of interest in conservation initiatives (Kreuter et al. 2006). The weak relationship between PRO and interest in endangered species habitat conservation contracts suggests that future studies using different psychological models are needed to contextualize the relationship between property-rights orientations and interest in conservation incentives for endangered species habitat. Future efforts to link landowner interest with property-rights orientations should consider mediating relationships associated with attitudes, norms, and values (Peterson and Rodriguez 2012).

Positive relationships between PAST PARTICIPATION in conservation programs and IMPORTANCE of endangered species conservation, and interest in endangered species habitat conservation contracts provide face validity for this study. Previous research suggests current or past experience with conservation programs were important determinants of interest. Arano et al. (2004) found that nonindustrial private forest landowners who had participated in landowner assistance programs were more interested in participating in a proposed reforestation program for encouraging reforestation after harvest than were other landowners. Kramer and Jenkins (2009) found that farmers who were currently enrolled in a payment for ecosystem services program were more likely to be interested in

future-payment-for-ecosystem-services programs. Gyawali et al. (2003), however, found that limited-resource farmers were less likely to be interested in CRP if they had previously participated in other government programs. Although we are aware of no previous research on program participation behavior that included variables related to the importance of a conservation objectives, it is logical to expect those who rank an objective higher, compared to others, would be more likely to support a conservation initiative that addresses the objective.

Our research has helped to extend the knowledge of probable responses to conservation programs in NC. Our results suggest contracts may provide a viable alternative to easements for endangered species habitat conservation on private lands, especially in contexts where large areas must be protected quickly and where land management flexibility is needed. Findings from our study also extend the knowledge about preferences for types of conservation incentives and legal instruments employed, as well as about beliefs concerning property rights and commitment to endangered species.

MANAGEMENT IMPLICATIONS

Our results suggest market-based incentive program managers may be able to drive down costs and drive up durations for endangered species habitat conservation contracts with the use of market mechanisms (e.g., reverse auctions). Findings from our study and the proof of concept for the Fort Hood RCS (TX; Wilkins et al. 2008) suggest that program managers should expect preferences for endangered species habitat conservation contract duration to be near 10 years unless competition is used to drive the duration higher. Further, using contracts longer than 10 years will help avoid prohibitively high transaction costs. Program managers seeking higher participation rates and more competition for contracts should target state-level organizations with agricultural and forestry interests to manage conservation contracts. Framing contracts as protecting ecosystem services or threatened habitat (without the association with the endangered species label or a specific species) may increase landowner interest. Short-term contracts may be particularly valuable for efforts requiring engagement from older landowners who are concerned about intergenerational land transfers. Although term contracts may be frowned upon by some interest groups precisely because they have a fixed duration, they may prove critical for wildlife conservation efforts requiring high levels of landowner support within relatively short time scales.

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