Targeting Potential Wildlife Management Cooperators

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Abstract: Participants in the Conservation Reserve Program (CRP) in Virginia were surveyed to determine their acceptance of the wildlife management options available. The resulting data were subjected to statistical analysis through logit models to enable prediction of desire to improve wildlife habitat and actual implementation of habitat improvement. The analysis indicated that landowners who retired >16.2 ha or who farmed >40.5 ha were most likely to incorporate wildlife management practices. We suggest that wildlife agencies utilize survey research data to better target their private landowner outreach programs.

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Wildlife agencies are limited in the time and funds that they can devote to promote wildlife habitat on private farmland. Wildlife agencies can announce their willingness to work with private landowners through news releases, publications available to farmers at county U.S. Department of Agriculture offices, and other mass media outlets. While many landowners will respond to such announcements, many who were interested in wildlife habitat improvement through the Conservation Reserve Program (CRP) in Virginia did not (Miller and Bromley 1989). (The CRP is a program in which >12 million ha of highly erodible land has been retired on a tract by tract basis for a 10-year period beginning when the agreements with individual farmers are approved). Among other things, the CRP objectives include improvement of food and cover for wildlife on the land. Three CRP cover practice options

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focus specifically on wildlife: 1) permanent wildlife habitat, 2) wildlife foodplots, and 3) shallow water areas for wildlife.) It is not feasible for agency wildlife managers to contact personally every landowner, but wildlife managers should identify and offer to work with landowners who are likely to implement wildlife practices. We surveyed half the CRP participants in Virginia to assess their acceptance of the wildlife options available in CRP (Miller and Bromley 1989). A further analysis of the attributes of the landowners in CRP permits prediction of those most likely to desire and implement wildlife management plans. In this paper we describe this analysis and suggest how managers can use this technique to better market their services to willing landowners.

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Methods

Names and addresses of all Virginia CRP participants (N = 1,616) were collected from ASCS offices in 1988. One-half of the participants were selected at random to receive a mail-survey instrument previously tested in Poweshiek County, Iowa. Dillman's (1978) total-design-method was followed in questionnaire design and mailing procedure. No attempt was made to contact nonrespondents (24% of sample) to the mail survey, but an analysis of early versus late respondents indicated that nonresponse bias was unlikely (Miller 1989).

Virginia CRP participants were asked if they would like to "improve wildlife habitat on their retired land." The responses to this question were used to form a 0/1 dummy variable (IMP). Respondents that implemented a cover practice option that benefited wildlife were pooled to form another 0/1 dummy variable (HABI). These 2 variables were the dependent variables of the models and were regressed on 21 CRP participant attribute variables.

All attribute variables were 0/1 dummy variables except for INC and FARM. INC was an ordinal variable (5 categories) that represented the proportion of income a CRP participant received from farming. One represented all or nearly all income was from farming, while 5 represented 25% of the respondent's income was from farming. FARM was a nominal variable with 3 categories: crop farm, livestock farm, and livestock and crop farm.

A logit model was used to determine the influence of the 21 attribute variables (Tables 1, 2) on whether respondents did or did not desire wildlife habitat improvement on their retired land (IMP) and had or had not implemented wildlife options (HABI). A logit model was formulated as an alternative to the more usual linear regression model to account for the fact that the dependent variables only take on 2 values (0,1); in our analysis, 0 stands for no and 1 for yes.

The logit model is specified as follows (Gujarati 1988):

Table 1. Logit regression results from regressing desire to improve wildlife habitat on CRP land (IMP) against CRP participant attributes.

Independent variable	Definition	Coefficient	*t*-ratio	*P*-value	$\frac{\delta P_i}{\delta X_i}$
A30	age <35	0.2647	0.459	0.6466	0.0519
A40	age 35–44	(base)			
A50	age 45–54	0.8881	2.292	0.0219	0.1741
A60	age 55–64	0.1665	0.5	0.6174	0.0326
A65	age >64	0.1632	0.488	0.6256	0.32
AC100	> 40.5 ha farmed	0.6275	2.933	0.0034	0.123
INC	proportion of income from farming	0.0683	1.092	0.2749	0.0134
RE41	> 16.2 ha in CRP	−0.0833	−0.313	0.7546	−0.0163
E8	8 years formal education	−0.4639	−1.355	0.1754	−0.0909
E10	9–10 years formal education	−0.2921	−0.909	0.3632	−0.0573
E12	11–12 years formal education	(base)			
E15	13–15 years formal education	0.3918	1.421	0.1553	0.0768
E16	16 years formal education	0.4566	1.233	0.2174	0.0895
E17	17+ years formal education	0.3667	1.052	0.2926	0.719
YR5	≤5 years in farming	0.5349	1.405	0.1599	0.1049
YR10	6–20 years in farming	(base)			
YR20	>20 years in farming	−0.1649	−0.704	0.4815	−0.0323
ELG0	more land eligible for CRP	−0.053	−0.227	0.8206	−0.0104
MF	sex	−1.1043	−4.901	<0.0001	−0.2165
LIV0	live on farm	0.0625	0.257	0.7973	0.0123
LIV1	live w/i 16 km of CRP land	(base)			
LIV2	live > 16 km from CRP land	0.1051	0.332	0.7398	0.0206
TR21	planted > 8.1 ha of CRP to trees	0.1719	0.649	0.5165	0.0337
OWN	own CRP land	0.2562	1.02	0.3705	0.0502
FARM	type of farm	0.1025	1.026	0.3049	0.0201
intercept		−0.2265	−0.456	0.6482	

$$P_i = \frac{1}{1 + e^{-z}}$$

where e is the base of natural logarithms, Z_i is $\beta_1 + \beta_2 X_i$, and P_i is the probability of a CRP participant desiring wildlife habitat improvement (IMP model), and implementing a wildlife option (HABI model) for given values of X (a $j \times 1$ vector of CRP participant attribute variables). This equation can be manipulated for estimation purposes to

$$\ln \frac{P_i}{(1 - P_i)} = \beta_1 + \beta_2 X_i$$

The dependent variable is the logarithm of the odds that a particular CRP participant will desire habitat improvement (IMP model) or implement a wildlife option (HABI model), β_1 is the intercept, and β_2 is a $1 \times j$ vector of regression coefficients corresponding to the j independent variables included in X.

The regressors defined in Tables 1 and 2 were included in both models. As noted above, dependent variables are binary, having the value of 0 or 1. In the IMP

Table 2. Logit regression results from regressing implementation of CRP wildlife options (HABI) against CRP participant attributes.

Variable name	Definition	Coefficient	*t*-ratio	*P*-value	$\frac{\delta P_i}{\delta X_i}$
A30	age <35	1.1044	1.729	0.0838	0.0762
A40	age 35–44	(base)			
A50	age 45–54	0.4362	0.828	0.4075	0.0301
A60	age 55–64	0.714	1.448	0.1475	0.0493
A65	age >64	−0.1554	−0.284	0.7762	−0.0107
AC100	> 40.5 ha farmed	−0.0131	−0.038	0.9699	−0.0009
INC	proportion of income from farming	−0.0194	−0.196	0.8445	−0.0001
RE41	> 16.2 ha in CRP	1.1585	3.364	0.0008	0.08
E8	8 years formal education	0.064	0.102	0.9186	0.0044
E10	9–10 years formal education	−0.0609	−0.101	0.9194	−0.0042
E12	11–12 years formal education	(base)			
E15	13–15 years formal education	0.9423	2.454	0.0141	0.065
E16	16 years formal education	0.8774	1.953	0.0508	0.0606
E17	17+ years formal education	0.6874	1.508	0.1316	0.0475
YR5	≤5 years in farming	−0.4202	−0.806	0.4203	−0.029
YR10	6–20 years in farming	(base)			
YR20	>20 years in farming	−0.0668	−0.197	0.8441	−0.0046
ELG0	more land eligible for CRP	0.0399	0.123	0.9019	0.0028
MF	sex	−0.857	−1.942	<0.0521	−0.0592
LIV0	live on farm	0.615	1.645	0.0999	0.0424
LIV1	live w/i 16 km of CRP land	(base)			
LIV2	live > 16 km from CRP land	0.2158	0.466	0.6411	0.0149
TR21	planted > 8.1 ha of CRP to trees	0.1617	0.471	0.6374	0.0112
OWN	own CRP land	−0.121	−0.347	0.7287	−0.0084
FARM	type of farm	0.2177	1.504	0.1325	0.015
intercept		−3.9663	−4.794	<0.0001	

model, 0 represents no desire to improve wildlife habitat on CRP land. In the HABI model, 0 represents no implementation of wildlife options on CRP land. The sign of the estimated regression coefficients indicate the direction of the effect of a change in the regressor on the probability that the CRP participant desires wildlife improvement (IMP model) or implements a wildlife option (HABI model). Using the HABI model as an example, a positive sign on a regressor coefficient indicates that an increase in the value of the variable will increase a CRP participant's chances of implementing wildlife options on their retired land; a negative sign indicates that an increase in the variable's value would decrease the chance of a CRP participant implementing a wildlife option. A significance level of 5% ($\alpha = 0.05$) was used to assess the contribution of the regressors in each model.

The derivative of the probability that the CRP participant desired wildlife habitat improvement (IMP model) or would implement a wildlife option (HABI model) with respect to X_i was calculated and evaluated at the mean of the data. These derivatives indicate the amount of the respective probabilities change given a 1 unit change in the explanatory variable. Because the explanatory variables are not

continuous in the above models, the derivatives serve as a relative measure of the regressor's influence on the dependent variable.

Results

A useable response rate of 76% was obtained from the sample of 808 farmers surveyed. The majority of Virginia's CRP participants were located on the Piedmont in the south-central portion of the state. Most CRP participants (95%) owned all or a portion of the land they enrolled. Age category comparison of Virginia CRP respondents (x = 60 years) to all Virginia farmers (x = 53 years) showed that CRP participants were older ($\chi^2 = 96.6, P < 0.001$, 5 df) than those reported in agricultural census statistics (U.S. Dep. Commerce 1984). Most of the observed difference was due to a greater than expected number of CRP participants in the 65 and over age group ($\chi^2 = 49.4, P < 0.001$, 1 df). More ($\chi^2 = 249, P < 0.001$, 1 df) of the survey respondents were female (25%) than expected from census statistics (7.8%). Farming supplied ≤25% of most (78%) respondents' income. The majority (70%) of respondents live on or within 8 km of their CRP land. Respondents controlled significantly more land (x = 1130.8 ha, SE = 9.5, t = 6.02, $P < 0.001$) than was common to the average Virginia farm (x = 73.7 ha) (Miller 1989).

Most Virginia CRP participants (72%) desired to improve the wildlife habitat on their retired land. A much smaller proportion (11%) had implemented 1 of the wildlife options prior to involvement with CRP. The desire to improve wildlife habitat on CRP land and the actual adoption of wildlife options were not independent. Fifty-eight of the 66 CRP participants who implemented a wildlife option wanted to further improve the wildlife habitat on their retired land.

Both regression models were significant (IMP; $\chi^2 = 75.74, P < 0.0001$, 21 df, HABI; $\chi^2 = 58.03, P < 0.0001$, 21 df). Looking first at the IMP model (desire to improve wildlife habitat), 3 attribute variables were significant: age group 45–54, >40.5 ha in operation, and gender (Table 1). CRP participants in the 45–54 age group and who farmed >40.5 ha positively influenced the IMP variable. Because males were assigned 0 and sex had a negative coefficient, the results suggest that males were more likely than females to desire habitat improvement. A CRP participant most likely to desire wildlife habitat improvement could be characterized as a 45- to 54-year-old male farming >40.5 ha.

Alternatively, in the second model, 2 attribute variables were significant determinants of establishment of wildlife options on CRP land (HABI). They were the amount of acres retired and education level. CRP participant attributes that increased the probability of implementation of wildlife options were >16.2 ha in CRP and 1–3 years of education beyond high school.

The predictive capabilities of the logit models also were calculated (Table 3). Actual frequencies were compared with the predicted frequencies of the 0/1 dependent variable. Predicted outcomes had the highest probability of occurring. For example, if a predicted outcome had a probability of 0.55, it was predicted to occur. The IMP logit model predicted the correct outcome 72% of the time. The HABI

Table 3 Actual and predicted outcomes of the IMP (desire to improve wildlife habitat) and HABI (actual implementation of a wildlife option) models of CRP participant responses.

Model	Predicted 0	Predicted 1	Actual total
IMP model			
Actual			
0	41	139	180
1	32	404	436
Predicted total	73	543	616
HABI model			
Actual			
0	548	2	550
1	60	6	66
Predicted total	608	8	616

logit model predicted the correct outcome 90% of the time. The IMP model performed better at predicting which participants desired wildlife habitat improvement on their retired land. On the other hand, the HABI model accurately predicted the participants who did not implement wildlife options, but was suspect in predicting the CRP participants who actually did implement a wildlife option.

Discussion

CRP participants who want to improve the wildlife habitat on their retired land and those who actually implement wildlife options differ in proportions and significant predictor attributes. There is a great difference in proportions of CRP participants who desire wildlife habitat improvement and who actually implement a wildlife option on their retired land. Actual behavior is a better guide to the future than are present intentions (Payne 1951).

Gender, age, and education level were significant attributes in the 2 models. These attributes are of interest but probably not of practical value when targeting potential cooperators. One significant attribute of the IMP model and 1 of the HABI model variables are obtained easily from ASCS farm records. They are the number of acres that are retired in the CRP and total acres in the farming operation. Participants with >16.2 ha retired were more likely to implement wildlife options, while participants with >40.5 ha in their farming operation were more likely to want wildlife habitat improvement on their retired land. If wildlife agencies target CRP participants who meet these 2 criteria greater success in wildlife habitat improvement could be achieved on CRP land.

Regardless of whether or not there will be more land retired in future CRP programs, wildlife interests still can influence the management of land already

enrolled because the plans can be amended. The majority of CRP participants desire improvement of wildlife habitat on their CRP land. Even those who have implemented wildlife options on their CRP land desire further improvement of wildlife habitat on their retired land. A lack of information exchange concerning the implications of the 1985 Farm Bill has been a problem (Nowak 1988). Manpower and budget constraints prohibit wildlife agencies from visiting each landowner. However, wildlife managers could send a personalized offer to work with farmers who have >16.2 ha in CRP or who farm >40.5 ha. Essentially, we are suggesting that wildlife managers use the results of survey research to more efficiently market their services to private landowners.

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