CONCLUSION

This study has quantified the opportunity costs in foregone corn and soybean production of naturally vegetated field borders on farms in two distinct agronomic regions of eastern North Carolina. Data was collected using two different sampling methods, on 28 fields, in two separate years..

No adverse effects of field border vegetation on adjacent crop yields at field edges were found; indicating the opportunity cost of FB is primarily comprised of forgone crop production. Furthermore, calculation of opportunity costs in foregone corn and soybean yields indicated that, compared to corn production, installation of naturally vegetated field borders can be economically viable in Wilson County simply by removing unprofitable land from cultivation. Even in Carteret County, where corn production at field edges was profitable, field borders may become economically viable when conservation payments and alternate income sources which may be available are included in these calculations. In both corn and soybean crops, FB were most likely to be economically viable within the first combine pass at field edges and the presence of trees along field edges enhanced this viability.

These findings provide information to producers on the agronomic tradeoffs between field border installation and corn and soybean production. It follows that producer uncertainty regarding such costs and tradeoffs is reduced and a significant barrier to producer adoption of FB is removed (Morris et al. 1996, Purvis et al. 1989).

Time and funding constraints limited the scope of this work to comparisons between field borders and corn and soybean production in eastern North Carolina. The methods used, however, can be adapted by resource managers investigating agronomic tradeoffs of other conservation practices in other farming systems.

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Field Location	LSMean Yield (kg ha^{-1})	Std.Error LSMean	Pr>[T] Ho:LSMean=0	Pr>[T] Ho: LSMean(I)=LSMean(j) i/j	L1	L2	M	R2	R1
North Edge-1	7,374	102.4057	.0001	L1		.1517	.0001	.0096	.0336
North Edge-2	7,585	99.7682	.0001	L2	.1517		.0006	.1968	.4471
Center	8,132	99.7682	.0001	M	.0001	.0006		.0162	.0043
South Edge-1	7,771	99.7682	.0001	R2	.0096	.1968	.0162		.5860
South Edge-2	7,694	99.7682	.0001	R1	.0336	.4471	.0043	.5860	

Table One: Comparison of corn yields by combine pass from edge and center locations of eight fields in Carteret County, NC.

Crop	Edge	Yield (kg ha^{-1})	Crop	Edge	Yield (kg ha^{-1})
Corn	1	7,946	Soybeans	1	420
	2	9,520		2	3,440
	3	4,560		3	3,178
	4	7,913		4	1,512
	5	2,537		5	711
	6	4,009		6	3,327
	7	8,540		7	2,607
	8	4,582		8	1,494
	9	4,076		Average	2,085
	10	8,085			
	11	3,483			
	12	5,040			
	13	10,483			
	Average	6,213			

Table Two: Corn and soybean yields taken from passes zero in 1997 Wilson County fields.

Source	N	Sign Of Effect	F-Value	Pr>F
Border	38		0.0340	0.8561
Pass	38	Negative[1]	4.1668	0.0643
Border*Pass	38		0.0164	0.9002
Ditch	38		0.0261	0.8733
Trees	38	Negative	7.8903	0.0112

Table Three: Regression results for 1997 Wilson County corn yields from passes one and two.

[1] The effect of pass one when compared to pass two.

Source	N	Sign Of Effect	F-Value	Pr>F
Border	38		0.0674	0.7978
Pass	38	Negative[1]	6.7258	0.0225
Border*Pass	38		0.6071	0.4501
Ditch	38		2.1244	0.1756
Trees	38	Negative	12.3122	0.0056

Table Four: Regression results for 1997 Wilson County soybean yields from passes one and two.

[1] The effect of pass one when compared to pass two.

County	Crop	1997 Price ($ kg^{-1})	Passes Zero Mean Yield (kg ha^{-1})	Estimated[1] Variable & Fixed Costs ($ ha^{-1})	Break-even Production Level	Gross Income ($ ha^{-1})	Net Income ($ ha^{-1})
Carteret	Corn	.11	7,594	775.95	7,280	812.93	33.60
Wilson	Corn	.11	6,213	825.57	7,719	665.12	(161.24)
Wilson	Soybeans	.28	2,085	363.51	1,412	537.52	173.40

Table Five: Opportunity costs of field border establishment in foregone corn and soybean production in Carteret and Wilson Counties, North Carolina.

[1] From North Carolina Cooperative Extension Service 1997 crop enterprise budgets.

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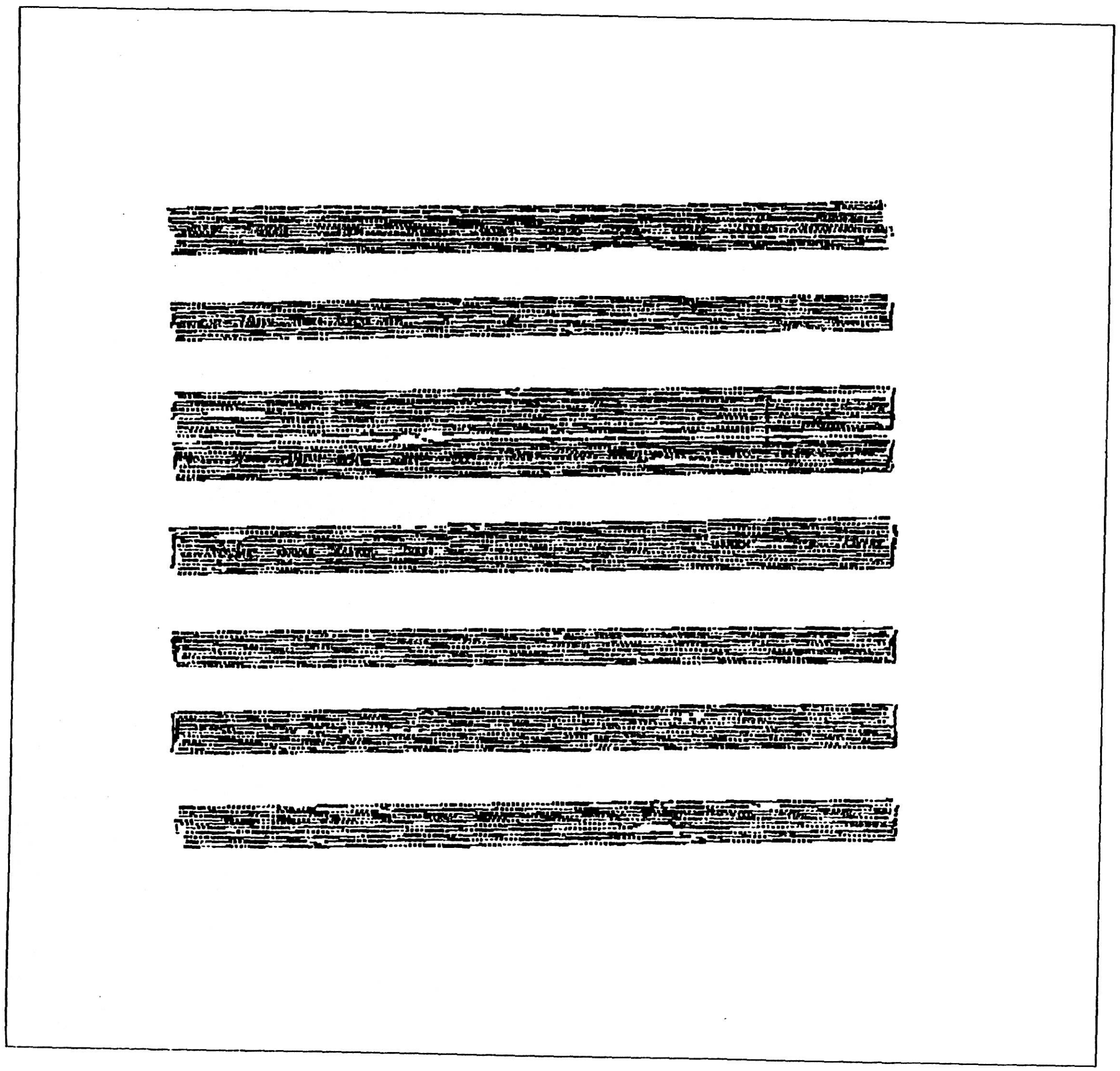

Figure One:
Carteret County, North Carolina
Corporate Farm Data
Fields One to Eight
'95 Corn Harvest

Produced with AgLink for Windows (TM)

AGRIS Corp.

Figure Two:
Carteret County, North Carolina
Corporate Farm Data
Fields One to Eight
grid

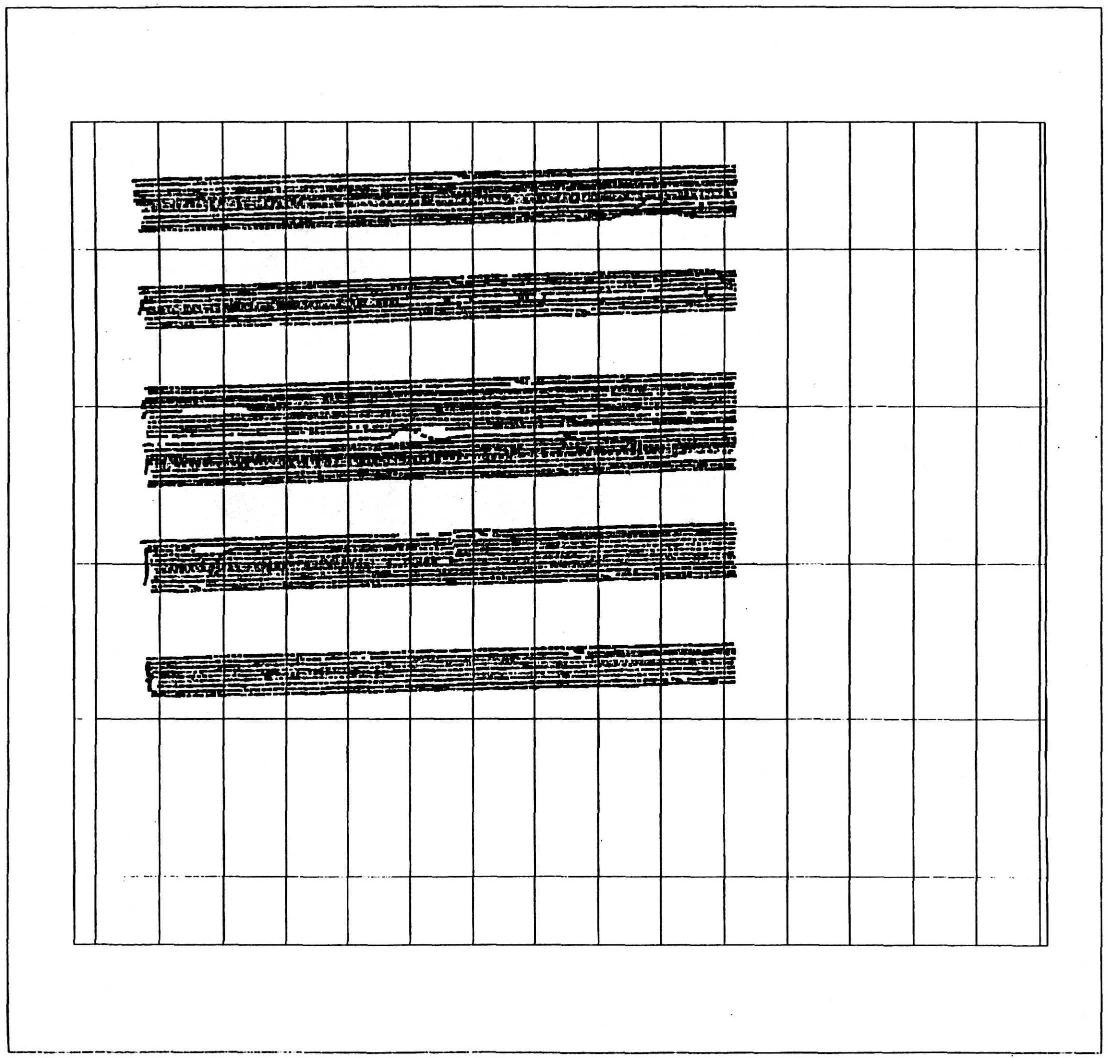

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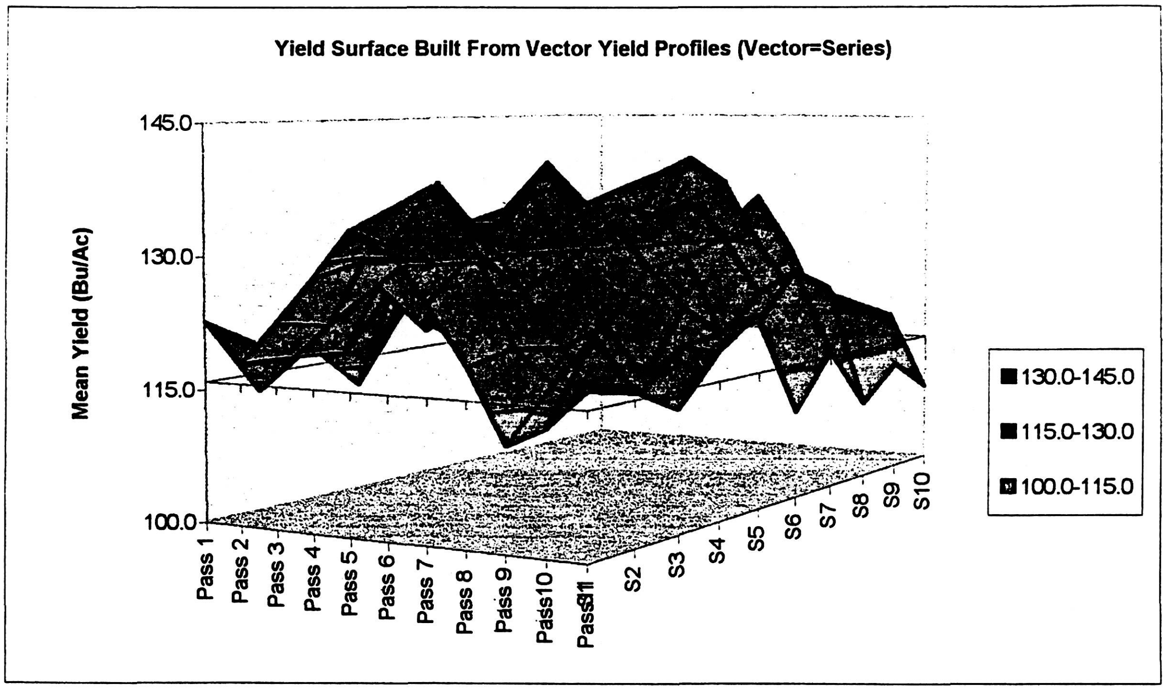
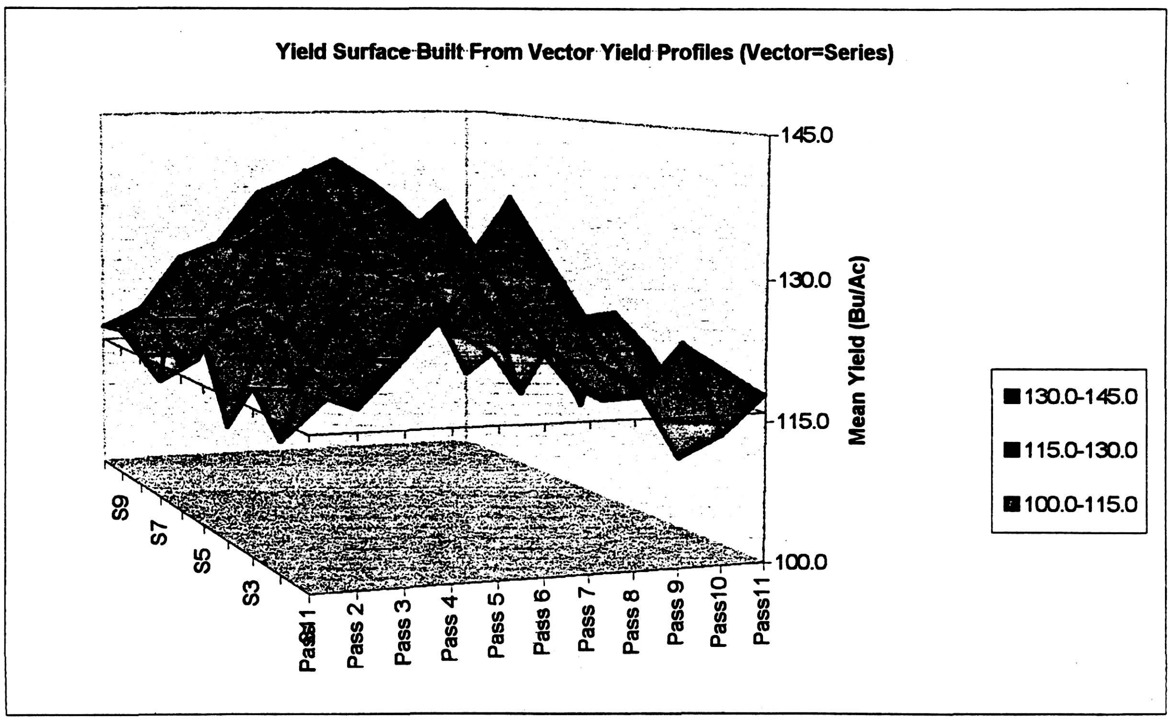
Figure Three: Yield Surface By Combine Pass and Vector.





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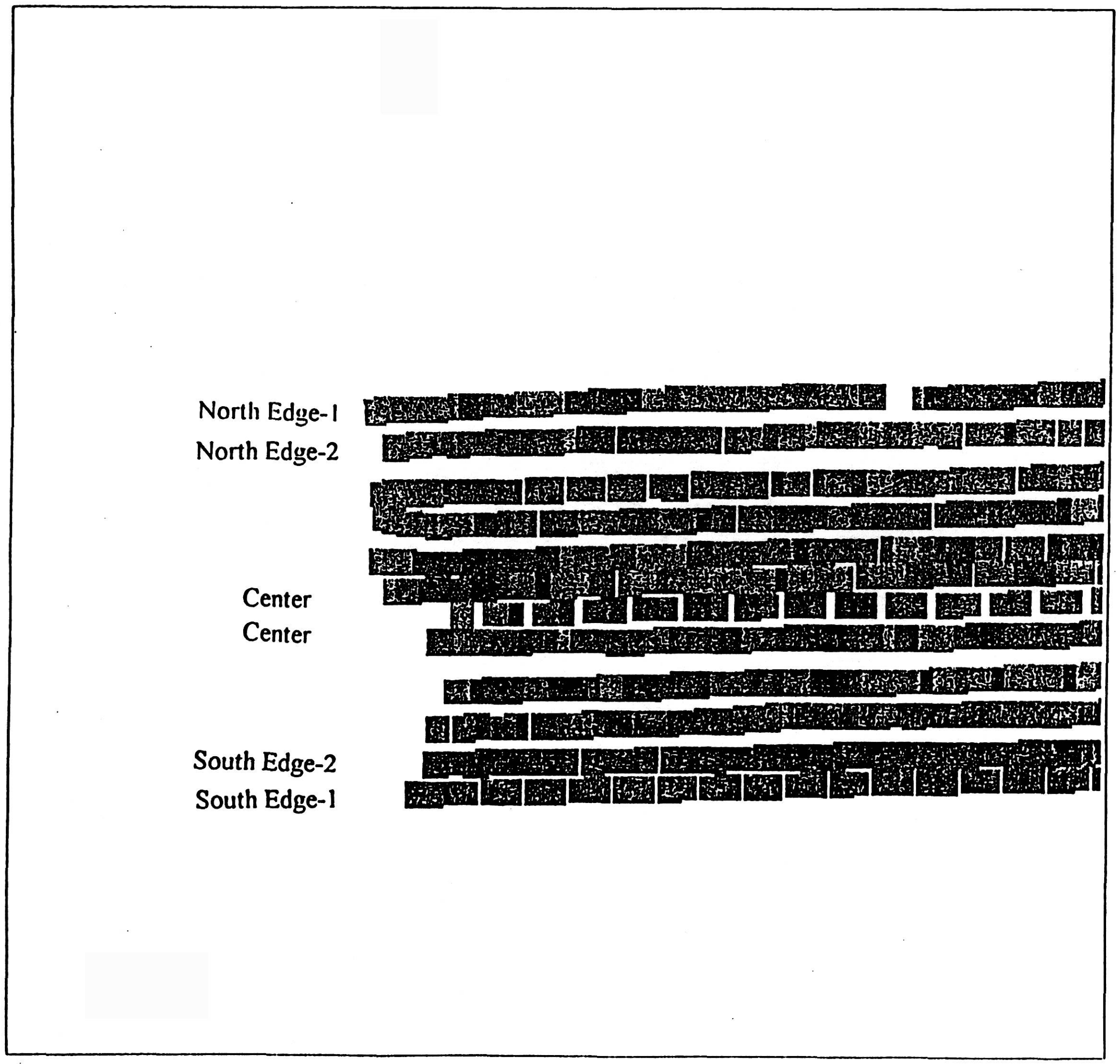

Figure Four:

Carteret County, North Carolina
Corporate Farm Data
Fields One to Eight
'95 Corn Harvest

Produced with AgLink for Windows

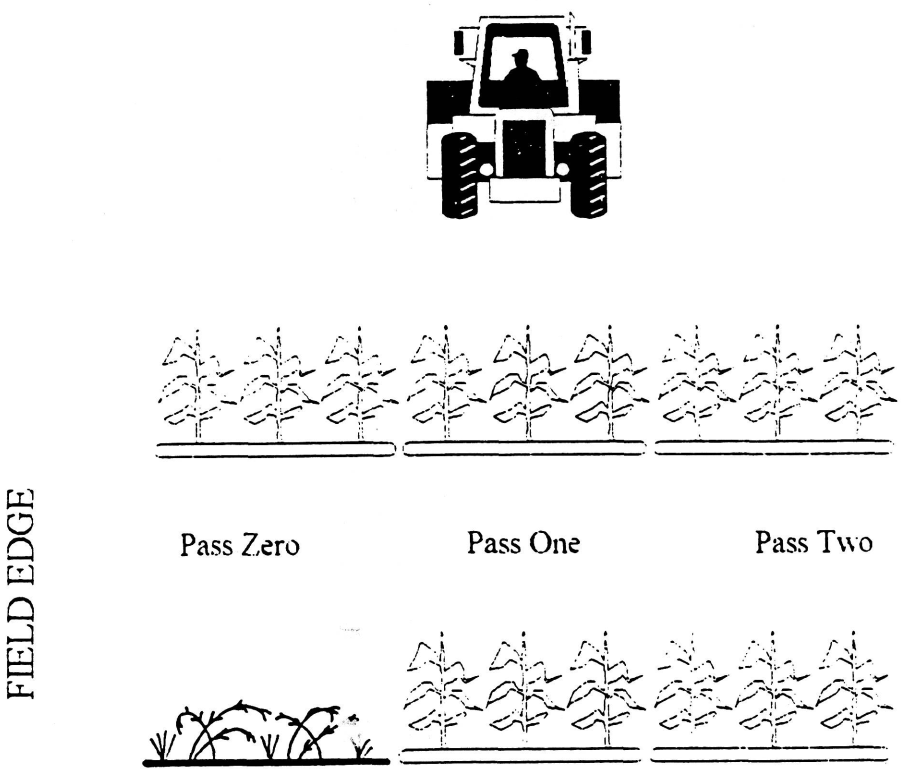

Figure Five: Wilson County Corn and Soybean Harvesting Regime for Field Border and Non-Border Areas.

Chapter Three: Conjoint Analysis of Hunter Willingness-To-Pay for Quail Hunting in Eastern North Carolina

Morris, James Theodore and Peter T. Bromley

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Abstract: Information on economic values of wildlife recreational opportunities on private lands is essential in evaluating investments in wildlife habitat on rowcrop areas. Conjoint Analysis (CA) was used to generate dollar values for previously unpriced attributes of wild quail hunting trips. Estimates of willingness-to-pay ranged from ($23.69) for the least preferred cover type to $63.79 for each additional covey found. Significant willingness-to-pay (WTP) levels also existed for reduced site congestion and legalized Sunday hunting. The resulting model can be used to predict hunter preferences and WTP for recreational wild quail hunting trips offered by rural land owners. These predictions allow landowners to evaluate the economic feasibility of habitat enhancement projects and wild quail hunting operations.

INTRODUCTION

Eastern North Carolina is a productive crop and livestock region. Soybeans, corn, wheat, peanuts, cotton and tobacco are produced on family farms and large corporate operations. This is also the most productive area in North Carolina for bobwhite quail (NCWRC 1997), although even here the same decline in quail populations is seen as in other southern states (Brennan 1991). Investments in naturally vegetated field border systems may offer an opportunity to enhance quail populations and generate hunting lease income. Flush-count surveys in mid-summer indicated 4.3 times the number of quail on two farms with field border systems as on those without (Puckett et al. 1995). In addition, field borders provide habitat for other game and non-game species and are a best management practice recommended for reducing non-point source pollution. Despite these benefits, producers are often unwilling to install field border systems on production lands.

Barriers to landowner adoption of field border systems include uncertainty about wildlife benefits, such as the response of quail populations, the financial cost of land conversion and the availability of government cost-deferment incentives. Landowners may also be deterred by community emphasis on "clean farming" practices. Such values may also hinder producers leasing acreage in competitive farmland rental markets (Morris et al. 1996).

People hold diverse and often sizable economic values for wildlife and other natural resources (USFWS 1993). Economists, sociologists and natural resource managers have worked to devise methods to elicit these values (Brown & Manfredo 1987). Such calculations, however, are difficult to make and yet the validity and reliability of these measures determines their usefulness (Whitehead et al. 1995). Recently, conjoint analysis (CA) techniques have been adapted from marketing research applications to quantify values people hold for attributes of environmental amenities. CA offers applicational and informational efficiencies over more traditional methods when valuing non-market attributes of environmental goods (Mackenzie 1993, Roe et al. 1994). CA is an extension of the closed-ended contingent valuation (CV) method. Instead of respondents being asked to value a change in one attribute of an environmental good, however, the conjoint approach asks respondents to value two or more goods, each comprised of bundles of attributes, where price is one of the attributes. Choices may be explicit as in pair-wise rating comparisons or implicit as in rankings or ratings of larger sets of attribute bundles.

"In de-emphasizing price as simply another attribute, the conjoint approach minimizes many of the biases that can arise in open-ended CVM studies when respondents are presented with the unfamiliar and often unrealistic task of putting prices on non-market amenities" (Mackenzie 1992 p.175). Conjoint analysis goes beyond traditional CV and offers superior informational efficiency by "decomposing a composite good into its constituent attributes, surveying respondents regarding their relative preferences for alternative bundles when multiple attributes are varied simultaneously, and quantifying marginal rates of substitution between attributes" (Mackenzie 1992 p.173). The marginal rate of substitution between a pair of attributes, where one of the attributes is price, represents the marginal valuation for the other attribute. The marginal rate of substitution is calculated as the negative of the ratio of the estimated coefficient of an attribute divided by the estimated coefficient on the fee variable. Positive ratios represent respondents' willingness-to-pay (WTP) for desired attributes. Negative ratios represent the marginal costs incurred when an undesirable factor is present, or conversely, the amount respondents are WTP to be without an undesirable attribute. Once the marginal utility and marginal WTP for each attribute have been identified, *predictions* can be made as to respondents' preferences and expected WTP for *new* combinations of the same attributes. Much has been written about the efficient design of conjoint questions and surveys for maximum information gain with the least amount of questions (Green 1974; Addelman 1962).

Conjoint analysis also avoids biases resulting from time valuation problems in the travel cost model and inefficiencies which result when the amount of travel may not be fully allocated to the recreational activity or to one particular site (McConnell 1979, Bockstael et al. 1987, Luzar et al. 1992, Randall 1994). CA can be used when information on related-market expenditures, needed for hedonic assessment, is unavailable (Pearse and Holmes 1993). Because conjoint values are calculated on a per-trip basis, additional questions on expected participation levels allow for policy analysis and welfare measurements covering more than single site-choice occasions; an advantage over random utility models (Feather et al. 1995, Parsons and Kealy 1995, Bockstael et al. 1987) . Unlike other models of recreational demand, CA is able to utilize rating and ranking schemes to investigate the significance of indifference and ambivalence in survey responses (Mackenzie 1993). Finally, CA often offers a more cost effective approach than more realistic market-based research methods.

Conjoint analysis, therefore, was used to derive economic values for attributes of wild quail hunting trips in eastern North Carolina. These values reduce landowner uncertainty when evaluating the economic feasibility of habitat projects and recreational operations and can be used to assess, construct and manage wild quail hunting opportunities on private lands in this region. To our knowledge this is the first time conjoint analysis techniques have been used to collect data for direct use in farm management decisions.

METHODS

In establishing economic values for quail hunting opportunities, it is essential to understand which attributes of the hunt are most important to dedicated quail hunters. A focus group comprised of 25 North Carolina Quail Unlimited chapter presidents identified eight attributes. These were the type of cover on the land (COVER), the number of covey contacts per day (CONTACTS), whether a guide was present or absent (GUIDE), the fee per day to hunt the site (FEE), the number of hunters not in the respondent's own hunting party on the site (HUNTERS), the size of the site in acres (SIZE), how many minutes the site was from the respondent's home (MINUTES), and finally, whether the site could be hunted legally on Saturday and Sunday or just on Saturday (SATSUN) **(Table One)**.

A mail survey was designed to facilitate a conjoint analysis of the marginal utilities hunters derive from the eight attributes and their marginal willingness-to-pay (WTP) for each. An asymmetrical, full-profile, fractional factorial, main-effects conjoint design was used. A main-effects design assumes that interaction effects are negligible among attributes and thus that the part-worth for a level of one attribute does not depend on the level of another attribute. SPSS's Categories module was used to construct the design for the eight hunt attributes resulting in 40 hypothetical hunt profiles (SPSS Categories Manual). The design was "full-profile" in that each of the hypothetical hunt stimuli (profiles) to be rated included some level for each of the eight attributes.[1] Common response formats in full-profile studies include rankings, ratings and pair-wise comparisons. Ratings were collected using an integer rating scales of one to ten, with one representing the least preferred and ten the most preferred. Each of the 2,422 respondents received a "customized" survey which contained four profiles randomly selected from the total pool of 40 hunts. While more tedious and costly, randomized assignment of profiles to respondents eliminated biases possible in block survey designs.

The SATSUN variable was included to investigate hunter preferences for legalized Sunday hunting; a current issue before the North Carolina legislature. For analysis purposes, the MINUTES variable was redefined as the midpoints of the relevant ranges; thus as 15, 45, 75 and 105 minutes. The FEE variable was included to allow calculation of the marginal rates of substitution between each of the other hunt attributes and money, in other words, the marginal cost or WTP for each attribute. With the marginal utility of the fee per day as the denominator, the FEE variable thus acts as the numeraire for the valuation of the other attributes (Mackenzie, 1992).

A site-fee-per-day attribute was utilized for several reasons. First, the Southeastern United States has a history of charging access fees for hunting opportunities (Bromley 1990, Busch 1987). Second, rapid population growth, development and farm consolidation have diminished available wildlife habitat and increased competition among North Carolina hunters for suitable hunting sites for numerous species of game including quail (Drake & Bromley 1997). This has resulted in a higher incident of payments by sportsman to shooting preserves and landowners for hunting opportunities (Brown & Decker 1990). Most importantly, information based on site access fees rather than trip costs was expected to be more useful to landowners evaluating the economic feasibility of offering recreational hunting opportunities.

The sample frame for the mail questionnaire was composed of North Carolina Quail Unlimited members and participants in the North Carolina Wildlife Resources Commission's annual Avid Quail Hunter Survey. Quail Unlimited is a national organization of quail hunting enthusiasts. The Avid Quail Hunter Survey is conducted each year in North Carolina to collect information on hunting activities and harvest numbers. This sample frame was constructed to include North Carolina's most dedicated or "avid" quail hunters in an effort to more effectively evaluate the economic viability of quail hunting operations on production lands. The final mailing list contained 2,422 possible respondents.

While mail surveys typically produce lower overall response rates and less item response than other survey methods, they are generally believed to result in more accurate answers with fewer biases. This becomes increasingly important when controversial or sensitive topics are addressed (Van der Zouwen and De Leeuw 1990). A mail survey format was chosen for this study as 1) a cost effective method for surveying the relatively large population of "avid" North Carolina quail hunters 2) the simplest means for presenting respondents with complex evaluation tasks and 3) the best approach for addressing controversial and sensitive topics such as legalized Sunday hunting and fee access hunting respectively. To some extent, each of the techniques espoused by Duncan (1979) and Yammarino et al. (1991) were utilized to enhance overall and item response rates in employing the total design method (Dillman 1978) (**Table Two**).

RESULTS

Questionnaires were mailed in mid July, 1996. Following Dillman (1978), reminder postcards were mailed in early September. Likely due to the concurrent arrival of Hurricane Fran in North Carolina on the night of September 5th, response to these reminders was nearly nonexistent. A second mailing to all non-respondents followed in mid-October 1996. Of the 2,422 surveys sent, 1002 were returned for an overall response rate of 41.4%. These responses contained 2,904 usable ratings data for the conjoint analysis. The mean number of ratings received for each of the 40 hypothetical hunts was 72.6.

Because willingness-to-pay estimates were calculated from *returned* surveys, these figures strictly represent the marginal WTP for wild quail hunt attributes among those hunters responding to the survey. Two questions arise; first, did respondents and non-respondents differ in some way which accounted for their decision to participate? If so, then the survey findings should not be generalized to the entire population of NC Quail Unlimited members and Avid Quail Hunter Survey participants. Second, did response rates differ across geographic regions? Such differences might indicate the existence of subpopulations whose characteristics were dependent upon geographic location and hence the need for separate WTP calculations by region. It was assumed that non-respondents did not differ from respondents and that the willingness-to-pay estimates could be generalized to North Carolina's "avid" quail hunter population.

Several exploratory forms of the model regressing ratings upon hunt attributes were run. In each, the four levels of the COVER attribute were expressed as three dummy variables to represent the various physical settings of the hunts with "mature forests and quail plantations" as the default. The results were combined into a final model with ratings regressed upon the eight attributes and the quadratic of CONTACTS. Ordinary Least Squares (OLS) regression techniques were not used to regress the ratings data upon the hunt attributes as these data have only ordinal and not cardinal significance (Madansky, 1980). Use of OLS would violate classical economic theory and OLS also "yields inefficient coefficients as well since ratings are discrete rather than truly continuous variables, and their variation is restricted to the ratings scale defined by the researcher" (Mackenzie, 1992).

While logistic regression is typically used to model dichotomous response variables, this procedure can also be applied to multi-level responses. "For ordinal response outcomes, you can model functions called *cumulative logits* by performing ordered logistic regression using the proportional odds model" (McCullagh 1980). Because the ratings scale had ten defined levels, and hence nine ordered rating intervals, an ordinal logistic procedure was used to conduct maximum likelihood estimations of the various models. Using SAS version 6.12 "The LOGISTIC procedure fits a parallel lines regression model that is based on the cumulative distribution probabilities of the response categories, rather than on their individual probabilities." (SAS/STAT User's Guide. 1994, p. 1073) This model has the form:

$$g(Pr(Y \leq i \mid \mathbf{x}))=\alpha_i + \beta'\mathbf{x}, \quad 1 \leq i \leq k$$

where Y are the ratings data, **x** is the vector of hunt attributes, $\alpha_1,\ldots, \alpha_k$ are k intercept parameters, and β is the vector of slope parameters.

> Since the Weibull distribution underlying the logit model so closely approximates the normal, confidence intervals for coefficient ratios are estimated via the method of Fieller. For example, the valuation formula $WTP_i=b_i/b_6$ (where b_6 is the coefficient on the fee variable) is expressed as the hypothesis $b_i-b_6WTP_i=0$, and confidence intervals for WTP_i can be solved from the quadratic roots of the inequality
>
> $$[b_i - b_6 WTP_i]/[S_i^2 - S_iS_6 WTP_i + S_6^2 WTP_i^2]^{0.5} > t$$
>
> (Where S_i^2, S_6^2 and S_iS_6 represent coefficient variances and covariance respectively) for the t-value corresponding to the desired confidence level (Mackenzie 1992).

The final model regressing ratings on hunt attributes took the form:

$$RATING = 1/[1+ e^{-\theta}]$$

where $\theta = a_1 + a_2 + \ldots + a_9 + b_1$**COVER1** + b_2**COVER2** + b_3**COVER3** + b_4**CONTACTS** + b_5**GUIDE** + b_6**FEE** + b_7**HUNTERS** + b_8**SIZE** + b_9**MINUTE** + b_{10}**SATSUN** + b_{11}**CONTACT2**

Estimation results from the model were used to calculate marginal cost and WTP calculations for the eight hunt attributes (**Table Three**).

DISCUSSION

Based upon comments from focus group participants, the type of cover was expected to be an important rating determinant. Hunters hold strong opinions about where game will be found. They prefer moving and enjoy dog handling in more open cover and associate the type of cover with the likelihood of successfully sighting and bagging game. Because hunting is a sport founded on the acquisition of game, the parameter estimate on CONTACTS (covey contacts per day) was expected to be important. Due to the difficulty many hunters claimed in finding quail, the presence of a guide was expected to be preferred. Similarly, the ability to legally hunt Saturday *and* Sunday (SATSUN) was expected to be important and preferred over Saturday being the only legal weekend day for hunting. Larger sites (500 or 1000 acres) were expected to be preferred to smaller ones (100 or 300 acres) as hunters may believe larger sites will provide more hours of recreation at a particular location. Because hunters expressed dislike for crowded hunting conditions due to safety concerns, lower probabilities of harvest success, and diminished quality of the outdoor experience, the parameter estimate for HUNTERS was expected to be large and significant. Estimates for the coefficients on FEE and MINUTES were both expected to be negative.

The estimation results may be better understood when viewed in conjunction with responses to related survey questions. Hunters were asked about their preferences regarding the type of cover on a site **(Table Four)**. The insignificant coefficient for COVER1 (crop fields and edges) suggests hunter indifference towards this type of cover;

despite being the most preferred cover type and the type most often hunted in. Estimates for COVER2 (cut-overs, thickets and young timber) were highly significant and resulted in a marginal cost of $23.69, with a 95 percent confidence interval of $ 5.62 to $ 42.09. This high marginal cost appears to conflict with hunters' beliefs that such areas "held the most birds" and were where hunters "found the most birds." Respondents' written comments, however, indicated they value ease of passage and conduciveness to dog work and the thick vegetation generally found in COVER2 makes both of these activities difficult. Although opposite in sign from that of COVER1, the parameter estimate on COVER3 (crop fields and cut-overs) was similarly insignificant. This may have resulted from COVER3 being a combination of the first two cover types. Hunters may think of cover types as singular in nature rather than as combinations of types; hence, they may have seen COVER3 as a less meaningful or confusing item. For each of the questions on cover type preferences, the default category (mature pine and quail plantations) received the least responses. One possibility for this is that hunters spent the majority of their hunting days on sites close to home rather than at out-of-state fee-hunting facilities typified by the default category. These findings emphasize the importance of careful selection of attribute levels when conducting conjoint studies.

The number of covey contacts per day (CONTACTS) was by far the most important attribute in predicting hunt ratings. The parameter estimate was highly significant indicating hunters' satisfaction with their wild quail hunting experiences depends primarily upon the number of quail encountered on a site. The marginal willingness-to-pay (WTP) for an additional covey contact per day was $63.79 with a 95 percent confidence interval of $56.82 to $71.65. The negative parameter estimate for the quadratic of the contacts variable (CONTACT2) indicates, however, a diminishing marginal utility and hence decreasing WTP as the number of covey contacts per day increases. Thus, a point of saturation is possible as more coveys are found within a given day; likely due to the intensive energy and time requirements of the sport.

Respondents were WTP $.05 for each acre (95 percent confidence interval equal to $ .03 to $ .07) or $5.00 for each one hundred acres, added to the site. Preferences for larger sites may arise because they may offer a greater amount of recreational time at one location thus reducing travel time among several sites over the course of a day. Hunters indicated a WTP of $12.62 to legally hunt the site Saturday and Sunday (90 percent confidence interval equal to $2.70 to $22.65), rather than just Saturday. This should not be strictly interpreted as the value of legalized Sunday hunting, but rather the incremental value of being able to legally hunt the entire weekend when only Saturday had been previously allowed. Elsewhere in the survey, hunters were asked if they would be willing to pay additional site access fees if they could legally hunt a site on Sunday, and if so, how much. Of the 938 respondents to this question, 44.2% (415) where willing to pay higher fees ranging in value from $ 2 to $ 5,000[2] However, as this question was somewhat open-ended, it is likely some respondents answered on a per visit basis and others on a yearly basis. The mode for these responses was $ 100 from 62 respondents. Finally, it is conceivable that hunters may view legalized Sunday hunting as a reduction in the cost of travel per hour hunted at a particular site. This could result in hunters being willing to travel farther to utilize sites which could be hunted an entire weekend.

(Mackenzie 1992).

The negative coefficients for GUIDE and HUNTERS indicated marginal costs existed for increases in these attributes. Respondents showed a preference for self-guided hunts with a marginal cost of a guide being present of $ 8.79 (80 percent confidence interval equal to $ 2.26 to $ 15.36). The level of site congestion was also a significant factor in determining hunt ratings with a marginal cost of an additional hunter on site of $15.02, with a 95 percent confidence interval of $ 12.03 to $ 18.23. Additional questions were asked in the survey regarding site congestion (**Table Five**). Strong concerns for crowding and reduced safety appear to have been primary causes for the large marginal cost of congestion.

Hunters indicated a marginal cost of travel time of $ .31 per minute (95 percent confidence interval equal to $ .12 to $ .51) or $18.60 per hour. With 37.8% of respondents indicating a total household income of at least $80,000, a foregone wage rate can be estimated at $20-$40 per hour.[3] Initially, these findings appear to support traditional valuations of travel time at a forgone hourly wage rate or fraction thereof. Roughly thirty three percent (33.4%) of respondents, however, selected “professional (lawyer, doctor, etc.)” as their occupation and 17.5% indicated they were retired. Additionally, 35.6% indicated they had received a college degree while 19.8% received some type of graduate degree. Such individuals are likely to illustrate the types of labor market rigidities described by Bockstael et al. (1987). Many may receive fixed salaries not tied to hours worked. Others may set their own desired work levels and assume any additional time to be for personal uses including recreation. Professionals may also utilize recreation time away from work to interact with business associates. Each of these points suggests that a forgone wage rate may not be the most appropriate value estimate for travel time.

While conjoint results showed Delaware waterfowl hunters valued travel time at $37.07/hour (Mackenzie 1992), the lower values for North Carolina quail hunters may reflect relatively shorter distances traveled. Data was collected on the number of days respondents hunted eight categories of sites and the average number of days each respondent spent on each site type (**Table Six**). Private land, both leased and unleased was by far the most common hunting location for respondents. Of those hunting on unleased private land, 60% traveled 20 miles or less (one way) to the site. For land leased by individuals or hunt clubs, 48.3% of hunters traveled 20 miles or less. For these two groups, 79.7% and 68.6% of the hunters respectively, traveled 45 miles or less. Among users of military land, 88.2% and 92.4%, traveled equal to or less than 20 and 45 miles respectively. Thus, those surveyed spent most of the season on sites within 15 to 60 minutes of their homes.

One confusing factor in quantifying recreational travel time is what may be termed the first-stop/multiple-stop effect. Because quail hunters may visit multiple sites in a day, it is unclear whether stated travel amounts are daily totals or the distance to the first, largest or most successful location. This discrepancy further supports the use of conjoint analysis to determine hunter WTP for wild quail hunt attributes as conjoint presents hypothetical trips on an individual, isolated basis.

CONCLUSION

Habitat enhancement projects on production lands can provide benefits for farm wildlife. When such projects occur as best-management-practices, such as field border systems, benefits may also accrue from decreased sediment and nutrient runoff. The results are enhanced wildlife populations and reduced non-point source pollution. Societal benefits accrue driven by the use, non-use and existence values citizens hold for animal, soil and water resources.

Current economic realities in modern agricultural production have resulted in sub-optimal wildlife populations for many consumptive and non-consumptive users. Hunters, conservationists and other nature enthusiasts are willing-to-pay for improvements in the health of various species such as bobwhite quail. Conjoint analysis techniques can be used to quantify these values and guide development of economic incentives for landowner adoption of field borders and other beneficial habitat enhancement projects. Knowing amounts hunters are WTP for hunt attributes also reduces the financial risk and market uncertainty faced by landowners evaluating this type of alternative land-based income opportunity. Conjoint data allows tailoring of resource management strategies to meet the diverse recreational needs of hunters (Hendee 1974) seeking high quality, wild quail hunting experiences unavailable on shooting preserves or public hunting grounds.