Conservation Reserve Program (CRP)
North Dakota (ND) and South Dakota (SD)
Hunter Expenditure & Valuation Survey
OMB control Number 0560-NEW

PART B. Collections of Information Employing Statistical Methods

1. **Describe (including a numerical estimate) the potential respondent universe and any sampling or other respondent selection method to be used. Data on the number of entities (e.g., establishments, State and local government units, households, or persons) in the universe covered by the collection and in the corresponding sample are to be provided in tabular form for the universe as a whole and for each of the strata in the proposed sample. Indicate expected response rates for the collection as a whole. If the collection had been conducted previously, include the actual response rate achieved during the last collection**.

There are about 128,000 hunters in North Dakota and 171,000 in South Dakota. The proposed survey has six strata that will solicit responses from 3,000 hunters in each state. The sampling is a stratified sample, with the strata being deer hunters, upland game bird hunters and waterfowl hunters within each state. Within each stratum hunters will be selected randomly. The states of ND and SD will provide the sample frame within each species strata from their license lists. The number sampled takes into account the voluntary nature of the survey and the anticipated level of non-respondents. The expected response rate is 60 percent as described in greater detail below.

2. Describe the procedures for the collection of information including:

- **Statistical methodology for stratification and sample selection,**
- **Estimation procedure,**
- **Degree of accuracy needed for the purpose described in the justification,**
- **Unusual problems requiring specialized sampling procedures, and**
- **Any use of periodic (less frequent than annual) data collection cycles to reduce burden.**

The hunters will be stratified by hunter type (e.g., waterfowl hunters, deer hunters and upland game bird hunters) and by the two states (e.g., ND and SD). Using random sampling a total of 6000 hunters will sampled: 1000 North Dakota deer hunters, 1000 North Dakota upland game hunters, 1000 North Dakota waterfowl hunters, 1000 South Dakota deer hunters, 1000 South Dakota upland game hunters, and 1000 South Dakota waterfowl hunters. The North Dakota and South Dakota state wildlife agencies have each agreed to provide 3 separate lists of names and addresses for deer, upland game, and waterfowl hunters. The lists are generated using the permits hunters purchased, and the hunters sampled will be selected randomly from these lists and mailed surveys. Given the expected 60% response rate (discussed below), this sample size should yield a power of 80% to detect differences between CRP hunters and non-CRP hunters.

Microsoft Excel will be used to error check data entry and check for and identify outliers. These processes can be conducted using logic test operations and the data sorting procedure. Excel will also be use to develop descriptive statistics of the survey responses and estimate the mean and variance for the estimates. The confidence intervals will be calculated to provide upper and lower boundaries around the estimates.

The statistical relationships between hunter use, hunter harvest success, wildlife populations and CRP enrollment in each county (i.e. hunter response models Use = func (CRP acres, success rates …) Success = func (CRP acres, wildlife populations …)) will be estimated with either OLS regression or a count data model using either Eviews or Stata statistical package.

Estimating the economic impact of the Conservation Reserve Program (CRP) on the Recreational Sector requires 3 steps:

1) Estimation of the effect of CRP on the wildlife populations of interest
2) Estimating the change in outdoor recreation associated with higher wildlife populations
3) Estimating the economic impacts of changed levels of outdoor recreation.

Because hunting is a high valued, regulated activity, changes in hunting activity will be used as a proxy for the outdoor recreational sector. We recognize that limiting the estimation of outdoor recreational economic benefit to just hunting will result in a conservative estimate, but obtaining reliable information on other outdoor recreational activity such as photography, bird watching, and other forms of wildlife observation would be too expensive, and no studies estimating the effect of CRP on fish populations are available.

The steps will be discussed in turn:

1) Estimates of the effect of the CRP on wildlife populations have been conducted using multiple approaches (Reynolds et al., 2001; Niemuth et al., 2007, Reynolds, et al., 2007, Nielson et al., 2008, and others). These analyses have been conducted by either examining population response to CRP covers over time, or in the case of waterfowl using established and validated wildlife population models based on landscape features to estimate waterfowl populations with and without CRP covers.

Over recent years innovations in geospatial information system analysis and the Department of Agriculture's common land unit (CLU) data has permitted rigorous examination of the effects of adding or subtracting grass, buffers, and wetlands to a landscape. The CLU data provides the exact location of agricultural fields on the landscape. These data when combined with CRP contract data can be integrated with other data such as the "Four Square Mile", the Breeding Bird Survey, and State data collection efforts to estimate and validate nesting, breeding, and survival rates, which in turn provides reliable estimates of the role of CRP and other conservation measures on wildlife populations.

FSA is working with U.S. Fish and Wildlife Service (USFWS) to develop estimates of waterfowl and grassland bird populations with and without CRP. This agreement will facilitated by existing agreements with USGS, USFWS, and joint ventures. Current agreements include:

- An agreement with the United States Geologic Survey's (USGS) Northern Prairie Wildlife Research Center to develop an Integrated Landscape Model of ecosystem services provided by CRP wetland and grass conservation systems,
- An agreement with the United States Geologic Survey's (USGS) Fort Collins Science Center to quantify ecosystem services from CRP grasslands, and
- An agreement between FSA, USFWS Prairie Pothole Joint Venture, USGS, and Colorado State University to assemble and share geospatial data to inform decision making and conservation program delivery in the Prairie Pothole region.

Additionally, the North Dakota Game and Fish Department and the South Dakota Game, Fish, and Parks Department have provided wildlife, hunter license, and public access data that enable the estimation of wildlife population effects and hunter demand due to CRP.

2) Wildlife populations with and without CRP are then used to estimate the changes in hunter harvest success rates due to CRP. Hunting Demand is a function of the likelihood for success, which in turn is positively related to the wildlife population. CRP also positively influences hunting demand by

increasing hunter access to suitable habitat. The functional relationship can expressed as:

> Hunter Trips = f (hunter success rates (+), hunting access (+), travel cost, travel time, income, age, retirement status, ...).

A hunter demand model will be developed and applied. The difference in estimated demand (number of trips per hunter) will be attributed to CRP.

Description of Step #2 Models

We hypothesize that the first hunter response to improved wildlife populations associated with CRP will be in the form of the number of people who choose to hunt in a given county. Since in Step #1 we will have documented the strong link between CRP lands and wildlife populations, we will use percent of the county in CRP lands as our reduced form variable for wildlife populations. We do this because changing CRP lands is our policy variable. The number of hunters times trips per hunter times hunter expenditures per trip will be our ultimate data input into the IMPLAN input-output model for calculating income and jobs dependent on CRP.

Therefore, the Step 2 model involves a multiple regression of how the number of hunters hunting in county i influenced by the percent of the county lands in CRP. Of course other factors that also influence the number of hunters going to a county i including the amount of public access outside of CRP (e.g., PLOTSit or WIAit, depending on whether SD or ND). In addition county demographics and percent of the county in public ownership such as BLM, USFWS and state wildlife management areas may matter as well and will be included in the model.

$$\text{Number of hunters}_i = Bo + B1\ (\%CRP_{it}) - B2(\%PLOTS_{it} \text{ or } WIA_{it}) + B3\ (\%\text{Public Land}_i) + B4\ (\text{County Demographics}_{it}) + B5\ (\text{Population}_i)$$

Where:
Number of hunters going to county i,
Number of hunters visiting county i for one of our three species (deer, waterfowl or upland game birds; separate model for each, however.)
%CRPit - is percent of county or hunt zone i in CRP lands in year t
%PLOTSit or WIAit - are public land access programs in ND and SD, respectively in county i in year t.
$\%\text{Public Land}_i$ - is percentage of the county in public ownership such as BLM, USFWS, or state wildlife management area.
$\text{County Demographics}_i$ in county i - are county level variables that will include separate variables for median income, percent white, median age, etc.
Population_i is the population of county i.

Using the estimated coefficients from this model we will forecast the number of hunters with and without CRP. Then this will be aggregated by county to arrive at the change in total number of hunters in that state due to CRP. This will be a factor in our Step 3 analysis of regional economic impact.

3) The change in hunter demand with and without CRP is used in the subsequent economic models to estimate the income, employment and consumer surplus generated by the Outdoor Recreation Sector. The difference between the two estimates will be the contribution to the sector attributed to the CRP. It is explicitly understood that the estimates with and without CRP are conservative because activity associated with wildlife observation, photography and fishing will not be included.

Empirical Specification of Models to capture effects of CRP:

To estimate the hunter trips per season a travel cost method (TCM) demand curve will be estimated. The TCM is a widely used and well accepted recreation demand modeling approach (Loomis and Walsh, 1997; Parsons, 2003; Haab and McConnell). The method has been recommended for use by Federal agencies since 1979 (U.S. Water Resources Council, 1979). Our TCM demand model estimation will be performed using a count data model in which t is the standard for trip frequency travel cost models (Creel and Loomis, 1990; Parsons, 2003). The count data estimates will be conducted using either Eviews or Stata statistical packages. The confidence intervals will be calculated for descriptive statistics and estimates of net economic value from the travel cost model.

Travel Cost Models:

One TCM will be estimated for each of three species in the Prairie Pothole region (ND & SD).The basic multi-site (sites are defined as counties) TCM model to test for statistical differences in number of trips per hunter and net economic value (consumer surplus) with CRP would be:

Hunter Tripsji = Bo - B1TCji + B2 (%CRPi) + B3 (%CRP*TC) + B4Harvestj + B5(CRPHUNT) + B6Demog + B7State…BnXn

Where:
Hunter Trips= number of trips by hunter j to county i, i=1..83
TC - is round trip travel cost
%CRP - percent of county or hunt zone in CRP lands (reflects wildlife population effects).
%CRP*TC - is an interaction term to allow for different slopes of the demand curve for %CRP land and hence different consumer surplus per trip as well.
$Harvest_j$ - is the hunter success rate (bag per day, or season).

CRPHunt - Dummy whether he/she hunted on CRP land (measure of the access provided)
CRPHunt*TC - is an interaction term to allow for different slopes of the demand curve for CRP hunters.
State: Dummy variable for SD and ND.

Evaluating Change in Value per Trip with CRP

The average consumer surplus per trip in the count data model we will be using for the TCM analysis is 1/B1 for non CRP hunters and 1/ (B1+B3) for CRP hunters (Creel and Loomis, 1990; Parsons, 2003). If B3 is statistically different from zero we will be able to compute separate estimates of consumer surplus for each CRP hunters as distinct from non CRP hunters.

Evaluating Changes in Trips and Regional Economic Effects with CRP

a. If the two intercept shifters on CRP land are statistically significant, then the magnitude of that coefficient will tell us what the difference in number of hunting trips is for hunters taking trips on CRP lands versus without CRP or in areas with a high percent of CRP land.

b. Harvest is another variable that may be influenced by CRP land. Thus, given the evidence that CRP lands result in higher wildlife populations, then harvest should go up as well. Thus, we can perform a "with CRP vs. without CRP" analysis of the change in trips with and without CRP using this avenue.

c. The survey also collects hunter expenditure data. Combining changes in trips with CRP with hunter expenditures yields the amount of hunter expenditures related to CRP land. This information on hunter expenditures serves as data for IMPLAN regional economic model. IMPLAN, an input-output modeling software that constructs Social Accounts that describe the structure and function of a specific local economy, will be used to calculate the change in income and employment in ND and SD with and without CRP. IMPLAN software is widely used by USDA agencies such as the USFS, as well as United States Department of Interior (USDOI) agencies such as USGS and BLM.

IMPLAN uses the model of the local economy to investigate the consequences of projected economic transactions in a geographic region, by examining the region's economic activity with and without these transactions. The combined change in number of hunters and change in trips per hunter will give us the change in total hunting trips, the economic transactions to be examined. This change in total hunting trips along with hunter expenditures can be entered into the IMPLAN model, and the change in the regional economic activity estimated.

d. Thus there are three pathways in which we can test for whether presence of CRP lands results in more economic value of hunting on private lands: (a) how trips per hunter changes with the amount of CRP in the county, (b) how number of hunters in the county change with the amount of CRP in the county and (c) how consumer surplus or value per trip changes with CRP lands.

The survey is designed as a one time only instrument.

3. Describe methods to maximize response rates and to deal with issues of non-response. The accuracy and reliability of information collected must be shown to be adequate for intended uses. For collections based on sampling, a special justification must be provided for any collection that will not yield "reliable" data that can be generalized to the universe studied.

The expected response rate is 60 percent; a conservative response rate to assure an adequate number of responses is obtained for analysis. Two prior hunter surveys in the upper mid-west had response rates over 68 percent (MN DNR 2002; 2005). Gigliotti (2009) sampled South Dakota hunters using Walk-In-Areas (private lands providing public access). The study had a 72 percent response rate from residents and a 77 percent response rate from non-residents using two mail contacts. McGinley and Hull (2011), obtained a 73.2% response rate for Wisconsin hunters targeting upland birds. The human dimensions specialist with the South Dakota Game, Fish, and Parks conducts season-after harvest surveys for game species pursued by residents and non-residents in the state each year (available at: http://gfp.sd.gov/hunting/harvest/default.aspx). In 2010—the most recent survey results available—all six of the studies conducted obtained response rates over 60 percent; with 5 of the 6 obtaining response rates of 77 percent or above. This survey uses up to four contacts (advance cover letter, initial survey mailing, second survey mailing and third survey mailing, each with a personalized cover letter and postage paid return envelope) to provide a 60% response rate. The use of four contacts has been demonstrated as a means to enhance response rates.

Several approaches will be taken to test for and if needed adjust for non-response bias. The first will be to estimate a “Heckman” style sample selection model, in which the first equation is a probit model of the decision to return the survey (yes=1, no=0) as a function of a few covariates known of the hunter from our mailing list (e.g., resident vs nonresident of the state dummy variable, living in urban area or not dummy, etc.). From this probit model an Inverse Mills Ratio can be calculated for each observation and included as a variable in the second equation Travel Cost Model demand curve. If the coefficient on the Inverse Mills Ratio is statistically significant, it indicates there is a systematic difference between those that returned the survey and those that did not. If the Inverse Mills Ratio is significant retaining it in the Travel Cost demand equation will correct this equation for sample selection, in our case survey non response. This method is available in the Stata statistics package.

Another approach we will employ to test for nonresponse bias and correct for it if necessary is to compare our sample statistics on critical variables to those from the North and South Dakota's own post-hunter harvest surveys. As noted in our original submission SD Game, Fish and Parks as well as North Dakota Fish and Game conduct their own post-season hunter surveys. We will compare our survey estimates and ND and SD's estimates of key variables such as number of trips taken (the dependent variable in our Travel Cost Model demand equation and a key factor in the IMPLAN economic impact analysis) and travel expenditures (the price variable in our Travel Cost Model demand equation and a key expenditure for the IMPLAN economic impact model). If there are differences between our sample statistics and theirs, *and* their survey has a higher response rate than ours, we will perform a weighting of our observations so that they match SD and ND Fish and Game's estimates of these two variables. That is, if our sample has higher average travel costs, we would weight those in our sample with above average travel costs less and those with lower than average travel costs more so that our survey estimate of the state's hunters weighted average matches the respective state Fish and Game's estimate. Thus, the weighted average trips and expenditures can then be input into the IMPLAN economic impact model to provide a more representative estimate of regional economic effects of hunting. The same weights applied to each sample observation as weights in the Travel Cost Model demand equation regression, i.e., weighted least squares. In this way the resulting regression coefficients will not be influenced by sample non response because the weight of each observation reflects its proportion in the more representative sample, rather than in our survey sample.

4. Describe any tests of procedures or methods to be undertaken. Testing is encouraged as an effective means of refining collections of information to minimize burden and improve utility. Tests must be approved if they call for answers to identical questions from 10 or more respondents. A proposed test or set of tests may be submitted for approval separately or in combination with the main collection of information.

Peer review among stakeholders such as ND and SD fish and game will take place. Informal pre-testing of the survey on less than 10 hunters will be conducted by CSU to eliminate unnecessary questions and clarify question wording before a formal pretest.

5. Provide the name and telephone number of individuals consulted on statistical aspects of the design and the name of the agency unit, contractor(s), grantee(s), or other person(s) who will actually collect and/or analyze the information for the agency.

Dr. Bengt Hyberg, Farm Service Agency (202-720-9222), Dr. John Loomis, Dept of Agricultural and Resource Economics at Colorado State University (970-

491-2485), and William Gascoigne, United States Geological Survey (970-226-9227). Dr. John Loomis developed the survey statistical design.

References

Creel, M. and J, Loomis 1990. Theoretical and Empirical Advantages of Truncated Count Data Estimators for Analysis of Deer Hunting in California. *American Journal of Agricultural Economics*, Volume 72(2): 434-441.

Gigliotti, L. 2009. Hunter Evaluation of the 2009 Walk-In Areas. Report to South Dakota Wildlife Division. Pierre SD.

Haab, T. and K. McConnell. 2002. Valuing Environmental and Natural Resources. Edward Elgar, North Hampton MA.

Loomis, J. and R. Walsh. 1997. Recreation Economic Decisions: Comparing Benefits and Costs. Venture Publishing, State College, PA.

McGinley, K. and S. Hull, 2011, Sharp-tailed Grouse Harvest & Hunter Survey: Wisconsin Department of Natural Resources.

Minnesota Department of Natural Resources (MN DNR), 2002, the 2002 Waterfowl Hunting Season in Minnesota—A Study of Hunters' Opinions and Attitudes: University of Minnesota, Cooperative Fish and Wildlife Research Unit.

Minnesota Department of Natural Resources (MN DNR), 2005, Waterfowl Hunting in North Dakota—A survey of Minnesota residents who hunt waterfowl in North Dakota: University of Minnesota, Cooperative Fish and Wildlife Research Unit.

Nielson, R.M., L.L. McDonald, J.P. Sullivan, C. Burgess, D.S. Johnson, D.H. Johnson, S. Bucholtz, S. Hyberg, and S. Howlin, "Estimating the Response of Ring-Necked Pheasants (Phasianus colchicus) to the Conservation Reserve Program," The Auk Vol. 125(2): 434-444. April, 2008.

Niemuth, N.D., Quaman, F.R., Naugle, D.E., Reynolds, R.E., Estey, M.E., Shaffer, T.L. 2007. Benefits of the Conservation Reserve Program to Grassland Bird Populations in the Prairie Pothole Region of North Dakota and South Dakota. Prepared for the U.S. Dept. of Agriculture Farm Service Agency. RFA OS-IA-04000000-N34

Parsons, G. 2003. Travel Cost Models. Chapter 9 in Primer for Nonmarket Valuation, eds P. Champ, K. Boyle and T. Brown. Kluwer Academic Press.

Reynolds, R., Shaffer, T.L. Renner, R.W., Newton, W.E., Batt, B.D.J., 2001. Impact of the Conservation Reserve Program on duck recruitment in the U.S. Prairie Pothole Region. Journal of Wildlife Management 65(4): 765-780

Ronald E. Reynolds, Charles R. Loesch, Brian Wangler, and Terry L. Shaffer. 2007. Waterfowl Response to the Conservation Reserve Program and Swampbuster Provision: In the Prairie Pothole Region, 1992–2004. Prepared for the U.S. Dept. of Agriculture Farm Service Agency. RFA OS-IA-04000000-N34

U.S. Water Resources Council. 1979. Procedures for Evaluation of National Economic Development (NED): Benefits and Costs of Water Resources Planning. Final Rule. Federal Register 44(242): 72892-977.