



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

The Conservation Reserve Program: A Literature Review

Cheryl J. Wachenheim

William C. Lesch

Neeraj Dhingra

**Department of Agribusiness and Applied Economics
Agricultural Experiment Station
North Dakota State University
Fargo, ND 58108-6050**

The authors are grateful to Delta Waterfowl Foundation, Bismarck, ND, for providing financial support for this project. They wish to thank Mr. John Devney for his assistance throughout.

North Dakota State University does not discriminate on the basis of age, color, disability, gender expression/identity, genetic information, marital status, national origin, public assistance status, race, religion, sex, sexual orientation, or status as a U.S. veteran. This publication is available electronically at this web site: <http://agecon.lib.umn.edu/>. Please address your inquiries regarding this publication to: Department of Agribusiness & Applied Economics, P.O. Box 6050, Fargo, ND 58108-6050, Phone: 701-231-7441, Fax: 701-231-7400, Email: ndsu.agribusiness@ndsu.edu.

NDSU is an equal opportunity institution.

Copyright ©2014 by Wachenheim. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

Table of Contents

	<u>Page</u>
List of Tables	ii
List of Figures	ii
Abstract	iii
Introduction	1
Commodity Prices and the Conservation Reserve Program	3
Slippage	6
Investigating the Land Value Question	7
Profiling Producers Enrolled into CRP	8
Predicting Enrollment	8
Bidding Behavior	9
Producer Attitudes, Perceptions and Intentions	9
Contract holders' views on CRP land use for recreation	14
Summary	16
Conclusions	17
Bibliography	19

List of Tables

<u>Table</u>	<u>Page</u>
1 Reasons respondents enrolled in CRP.....	10
2 Distribution of responses on attitude questions	11

List of Figures

<u>Figure</u>	<u>Page</u>
1 Prairie Pothole Region of the United States.....	3

Abstract

The Conservation Reserve Program, one of more than twenty voluntary conservation programs administered by the United States Department of Agriculture, was initiated under the Agricultural Act of 1985 and has evolved under subsequent farm bills. Today, enrollment acres are selected among qualifying land based on an environmental benefits index. Total land enrolled will drop to a maximum of 24 million acres under the Agricultural Act of 2014. This report covers a broad scope of existing literature related to the Conservation Reserve Program. Although much of the literature is dated and not reflective of today's markets, the currency of the message is that landowners respond to financial incentives. Further, uncertainty about the costs and financial benefits has endured as a hindrance to enrollment that may otherwise be attractive to landowners. Research supports the influence of a host of additional factors, including those non-financial. A focus on consideration of local conditions and specific conservation practices will aid future research, although specificity must be balanced against incorporating landowner consideration of other land-use alternatives. The literature emphasizes the need to educate decision-makers on all aspects of conservation program options likely to influence their enrollment decision using a venue that is accessible to them. This information should stress economic factors and focus on specifics such as the impact of a specific conservation practice locally and the likely economic impact of various options for the individual producer. We should look for innovative, efficient methods to increase farmer access to this information to include social networks and peer education.

The Conservation Reserve Program: A Literature Review

Introduction

Recent upward shifts in demand and price for corn and soybeans, two commodities grown on an increasing number of acres within the Prairie Pothole Region (PPR) of the United States, have been identified to be the primary drivers of producer decisions regarding participation in the Conservation Reserve Program (CRP) in the area (Stubbs, 2012; Rashford, Walker and Bastian, 2010). The Conservation Reserve Program is a voluntary long-term land diversion program administered by the Farm Service Agency (FSA) of the United States Department of Agriculture (USDA). In this program, farmers idle from production their environmentally-sensitive lands for conservation use in exchange for monetary compensation and technical assistance. It is one of over twenty voluntary conservation programs in the United States (Stubbs, 2013). Programs specifically geared towards land retirement and easements such as CRP comprised approximately 42% of available conservation funding in 2012. Total financial outlays to CRP enrollees were \$31.5 billion from 1995 to 2012 (Environmental Working Group, undated). As of December 2013, there were 25.6 million acres enrolled (Farm Service Agency, 2014).

Early USDA conservation programs began in the 1930s with a focus on reducing soil erosion and increasing availability of water for agriculture. In the 1950s, the Soil Bank Program, authorized by the Agriculture Act of 1956, focused on reducing both erosion and commodity stocks. These early efforts set the roots for what is today the CRP, a program authorized by the Food Security Act of 1985 as a long-term cropland diversion program. The primary objectives of the CRP were and remain conservation-oriented rather than related to supply control. Only land used in production was eligible.

The Food Agricultural Conservation and Trade Act of 1990 broadened eligibility of CRP to include more environmentally-sensitive land, that highly erodible, and expanded existing goals of reducing soil erosion and improving soil quality to include improving wildlife habitat and water quality (Jacobs, Thurman and Marra, 2011). In 1991, the bidding procedure was changed so that an Environmental Benefits Index (EBI) was employed in ranking bids and a maximum rental rate was determined for comparable cropland (Soil and Water Conservation Foundation and Environmental Defense Fund, 2008). The Federal Agricultural and Improvement and Reform Act of 1996 added wildlife habitat to the EBI and provided other options for farmers to participate (Kirwan, Lubowski and Roberts, 2005). A continuous sign-up was initiated for acreage devoted to specific conservation practices. In 1997, the USDA established the Conservation Reserve Enhancement Program (CREP), a partnership between the federal government and the state within which the land resides. The program was designed to encourage farm conservation practices that meet specific state and national conservation and environmental objectives (Farm Service Agency, undated).

In 2002, the eligibility of cropping history requirement for CRP enrollment was increased and changes were made related to contract extension and re-enrollment. A requirement was added that there be an equitable balance between program objectives. Eligibility requirements were once again changed in the 2008 Farm Bill. Changes included a reduction in the total acreage cap from 39.2 million in 2009 to 32 million in 2010-2012, addition of local preference criteria, authorization for the USDA Secretary to waive

the 25% of county cap, allowance that currently-enrolled land be automatically considered for re-enrollment, and a requirement for the USDA to post rental rates.

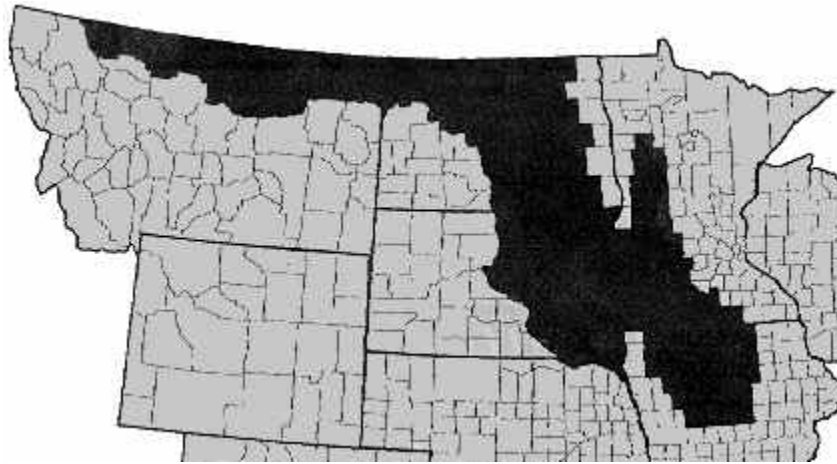
The Agricultural Act of 2014 legislates a drop in maximum CRP acres from 32 million to 24 million over its five-year life. It allows contract holders to terminate contracts in fiscal year 2015 for land enrolled for at least five years and in an eligible land class.

Land devoted to CRP is important to the Prairie Pothole Region (PPR), an area spanning parts of three Canadian Provinces (Alberta, Saskatchewan and Manitoba), and portions of five US states (Montana, North Dakota, South Dakota, Minnesota and Iowa; Figure 1). Estimates put over half of North American migratory waterfowl as nesting in the PPR (Environmental Protection Agency, undated). Within this region, CRP and the Wetlands Reserve Program (WRP) have restored approximately 5.4 million acres of wetland and grassland habitats (Gleason et al., 2008). Increasing acreage devoted to agricultural production challenges these wildlife habitat gains throughout this unique geological and biodiverse landscape.

Reduced conservation acres has resulted in losses to plant and animal habitat, increases in external costs expressed as lost carbon sequestration, reduced water quality, increased erosion, and reduction of other environmental benefits impacting many constituents, both local and downstream (Wright and Wimberly 2013; Reynolds et al. 2007; Niemuth et al 2007). Lawley (2013) helps explain why. Over the past two decades, discounts on wetlands have increased at least 40% and about half of the prairie potholes and surrounding grasslands have been converted for production, owing to lower cost conversion coupled with increased benefits from crop production.

Where Lesch and Wachenheim (2014) reported on the literature considering factors affecting adoption of conservation practices on working lands and in land retirement programs other than CRP, the current report reviews literature to identify factors contributing to CRP-enrollment or re-enrollment decisions. Studies reporting on the financial aspect of agricultural markets and enrollment in CRP, how slippage affects progress towards program objectives, the impact of CRP, other conservation programs and activities on land values, and landowner bidding are also considered. Finally, research profiling producers enrolled in the CRP and use of CRP land for recreation is discussed.

Figure 1. Prairie Pothole Region of the United States



From: Jacobs, Thurman and Marra (2011).

Commodity Prices and the Conservation Reserve Program

This review considers a conflux of factors facing landowners; perhaps the most notable being the rapid rise in commodity prices and its resultant effect on opportunity cost of land which otherwise is or might be devoted to conservation. Stubbs (2012) and Rashford, Walker and Bastian (2010), among others, note the downward shift in CRP enrollment in response to increasing commodity prices. Non-re-enrollment of marginal, as well as otherwise productive, tillable lands currently planted to grasses under the terms of the CRP is being attributed to their growing value in production. Other factors contributing to the reduction in conservation acres including the greater availability of production technologies (e.g., short season hybrids), farm program payments and subsidies, including those for crop insurance inviting row-cropping of soybeans and corn in areas previously excessively risky, and demand for agricultural land as a safe haven for stable, although modest returns by non-agricultural owner-investors are covered in more detail in Lesch and Wachenheim (2014).

The aforementioned represent factors affecting changes in opportunity costs facing land considered for conservation. In a look at the effect of CRP rental rate as an opportunity cost, Cooper and Osborn (1998) modeled CRP extensions under varying levels of rental payment (capitated at \$130/acre) and under varying conditions of haying/grazing (allowed or not) throughout the United States. As expected, effect of rental rate was positive. The influence of acres of non-CRP land used for livestock on likelihood of re-enrolling was larger for the scenario allowing haying / grazing than for that not. Farm income, market value of adjacent land, and erosion rate all negatively affected likelihood of reenrolling. Retired farmers were more likely to re-enroll in the no-grazing / haying scenario than others, and less likely to re-enroll in the scenario allowing grazing / haying than others. This may be because of a general preference by retired farmers against participating in a contract that involves working the land. Livestock owners were more likely to accept the no haying / grazing scenario than were non-livestock owners at bid levels

higher than and lower than the current rental rate although livestock owners *preferred* the scenario in which haying / grazing was allowed, especially at lower rental rates.

Secchi and Babcock (2007) modeled the effects of rising corn and soybean prices on the return of CRP to production status in Iowa. Because more productive soils were enrolled into CRP at lower rates (and higher program cost) throughout the state, the largest proportion of CRP-contracts were found in lower-productivity soils in the southern and northeastern areas of Iowa. The authors developed supply curves for CRP land at existing rental rates under corn price scenarios ranging from \$2 to \$5 / bushel with the assumption that soybean prices remained above \$4 per bushel¹. At that point in time, corn prices at \$3 per bushel would foretell the migration of about one-half of the state's CRP acreage back into production (approximately one million acres), while an increase to \$5 per bushel would result in about a 70% shift from CRP into production. The authors concluded higher CRP program payments would be required to reverse this direction, estimating that a doubling of annual rental rates under the assumption of \$4 per bushel corn price would result in the retention of one million acres, in comparison with about 700,000 acres under current payment rates.

Gill-Austern (2011) employed a series of models to evaluate the impact of corn prices, corn yield, state GNP, and corn acreage on CRP enrollments within the Corn Belt region (Indiana, Illinois, Iowa, Missouri, Nebraska, Ohio and Kansas) over the time frame 1986 to 2010. Increasing corn prices generally predicted reductions in CRP, and, depending on the model, these reductions ranged from 135,000 to 250,000 acres (estimated to be between 13 and 22% of enrolled acres) over a three-year, lagged impact window. Corn yields did not contribute to model efficacy, and results for state GNP were mixed, although they favored a negative relationship with CRP enrollments. The author points out short-term spikes in prices are not likely to impact enrollments, whereas the data reveal that after the three-year period, impacts are felt. This delay in effect may be attributable to costs arising from removal of land from CRP, and costs of returning that land to production, and is likely associated with producer management of risks and returns resulting from land conversion decisions.

The most comprehensive examination of the relationship between CRP acreage and crop prices is found in the contributions of Hellerstein and Malcolm (2011). They employed two simulation based techniques, including a *likely-to-bid model* (LTB; what might happen if the landscape for CRP was started from scratch and all acreages were to be enrolled at one time), and an *opt-out model* (O/O). In the O/O case, the current CRP acres are given and the model is deployed in the prediction of which acres would be converted to certain commodities under varying commodity prices, ethanol policy, and rental payments.

Basic questions addressed include: the impact of high prices and increasing demand for corn on CRP enrollment; the impact of higher CRP rental rates on program expenditures and land types enrolled; and how reduction in size of CRP would affect program distribution. The authors investigated four possible scenarios for shifts in CRP including:

¹ This assumption, employed in this study and elsewhere, may not well mimic the program as employed. Maximum bid rates for CRP enrollment are based on a soil suitability index, which relatively closely mimics local rental rates (i.e., it is unlikely that CRP rental rates would not change in response to even moderate changes in commodity prices).

- Use of a baseline reflecting conditions in 2005, using 2005 crop prices in the LTB model;
- A medium price scenario which makes use of crop prices observed in 2007; a variant examines the impact of a hypothetical increase in CRP rental rates of 60% over those of that year;
- A circumstance in which demand for ethanol rises from 6.5 billion gallons to 15 billion gallons; a variant includes CRP rental rate adjustments as in the medium price variant;
- A high price situation in which crop prices in the range of those that occurred in 2008 are examined; and a variant in which an across the board increase in CRP rates of 120% is applied.

The authors investigate the effects of the various scenario factors on several variables of interest to policy makers, including number of acres to be offered, average Environmental Benefits Index (EBI), level of foregone net agricultural revenue, rental payments, and proportional distribution of CRP acres across ten regions. While the study provides for national estimates, it does not afford state-by-state analyses or compilation in order that the PPR be examined. Note that in the case of both corn and soybeans, more recent market prices have been notably higher than those tested by Hellerstein and Malcolm, a limitation which suggests that recent times may have exceeded the upper boundaries of inference possible from this study.

Likely-to-Bid Modeling. Under the first scenario, authors compared the number of offers predicted by the model and respective approved contracts (baseline, *what is*). These were very close in outcome. For example, the predicted number of offers/contracts would have covered 51.9 million acres, and 30 million acres, respectively. In reality, the actual amount of acreage offered was 49.2 million acres and the number of approved contracts reflected 32.6 million acres. Predictive validity of the model was quite good on a national level, and this is important to establishing the value of the model in subsequent scenarios. Validity of the LTB model decreased when applied to individual regions.

The analysis of the various LTB scenarios suggested several outcomes. First, sharp increases in commodity prices occurring in the absence of increasing levels of CRP rental contract payments will result in reductions, perhaps dramatic, in overall CRP acreage. Second, under what the authors termed high price commodity scenarios, a doubling of the average payment would possibly ensure large numbers of offers and would permit the Farm Service Agency (FSA) to screen for properties with the overall highest EBI index scores. Third, land qualities of acreage enrolled will change depending on the scenario faced by the decision-maker.

Opt-Out Modeling. Whereas LTB modeling assumed that CRP starts anew, and provided for consideration of all lands, the O/O model may be more realistic in that it is predicated on actual enrolled CRP acres and may better reflect the diversity of land ownership. This modeling relied on contract data taken from 2008 at the level of the parcel to predict what use of the land would occur if CRP were to conclude. Future land use was predicated on historic use of the land prior to enrollment into CRP, and took into account the likely revenue stream under the most likely cropping scenario were the parcel to be returned to production. This model also assumed “no-penalty” for early-opt-out from the CRP program. Scenario analyses deployed under the LBT model were the same here, although regional outcomes were not examined.

Under a constant (no adjustment to CRP payment) rental rate scenario, wheat, soybeans, barley and corn, in that order, had the highest probabilities of conversion, supplanting CRP acreage, given their historic planting. Approximately 9.4 million acres would return to production. Were the USDA to adjust rental rates upward (60%), the order of planting alternatives did not change, although the model forecasted only 5.9 million acres leaving the program.

Summary of Findings: The findings from these two models are informative about the number and nature of acres likely to leave the CRP under varying conditions of rental rate and commodity pricing, as well as under the condition of a strong biofuels policy. It is noteworthy that a strong biofuels program is likely to have only a slight impact on CRP as both models demonstrated with likely reduction of less than two million acres and only slight declines in the EBI. Both models underscored the sensitivity of CRP to commodity prices in terms of the number of acres enrolled, as well as the EBI of those parcels. In both scenarios, more productive but also more sensitive lands would be among those to first depart the program. CRP enrollments which otherwise might be reduced under commodity price pressures were predicted to be higher under two rental payment scenarios, those reflecting 60% and 120% increases, contingent on the level (moderate or high) of crop prices. Under the LBT scenario, the impacts of higher price on CRP enrollments would differ by region. Under the more realistic O/O model, high price commodities in the absence of higher rental rates would result in approximately one-third of CRP shifting to production. Regional considerations were not investigated. Repeated for emphasis, readers should be especially sensitive to the applicability of these findings since recent commodity prices are well above those tested, suggesting still higher losses in the absence of adjustment to federal payments. This will be tempered by the programmed adjustment of CRP rental rates to the value of the land under current market conditions (i.e., local land rental rates).

Slippage

Slippage, referring to less than an acre to acre match between reduction in production and enrollment, reduces the environmental benefits of CRP. Slippage can result from the practice of substituting current non-cropland in production (currently fallow, idle, or other non-farmed parcels) for those entered into the CRP. Wu (2000) reported that for every 100 acres enrolled in the Central U.S. during 1982-1992, some 20 acres of newly converted lands occurred.² The largest coefficient in the prediction of slippage was the number of CRP acres enrolled as a portion of total land area (positive relationship).

The USDA estimated that the loss of rangeland and grassland between 1982 and 2003 was approximately 24.5 million acres, with most of this occurring during the first 10-year CRP period (United States Government Accountability Office 2007). In the Northern Plains (KS, NE, ND, SD), losses during this period were estimated to be between 4.85 and 6.69 million acres. This also was likely influenced by the availability of federally subsidized crop insurance, though offset to some degree by FSA provisions such as 'Sodbuster' or 'Swampbuster', the former requiring the development of conservation plans and penalties for new tillage of native parcels when they are defined as highly erodible. The GAO report also references a survey of NRCS officials in the four states where the number of local officials reporting that

² States in the study included ND, SD, NE, KS, MN, IA, MO, WI, IL, IN, MI and OH.

Sodbuster is of little assistance in limiting the conversion of native grassland to cropland was very high, ranging from 44% (North Dakota) to 70% (Nebraska).

Finally, Lichtenberg and Smith-Ramirez (2011) illustrated that the use of cost-sharing in Maryland would increase the use of conservation practices, but was also found to reduce vegetative cover, resulting in the possibility of greater harm than good with respect to erosion, carbon sequestration, and other desirable outcomes.

Investigating the Land Value Question

Research which has considered the impact of entry into CRP on the value of land or that of adjoining parcels is limited. Lin and Wu (2005) investigated the effect of CRP on both farmland and developed land prices using data drawn from approximately 2,900 counties in the lower 48 states. They showed a positive and statistically significant average impact on *farmland prices* of approximately \$25 per acre (1.8%) with greatest effects observed among the Mountain (9.8%), Southern (6.4%) and Northern Plains (4.5%) regions. Lesser effects were observed in the regions of the Corn Belt and Appalachia. They were smallest in the Lake States and the Northeast. Overall, CRP had a positive and significant effect on developed land prices in all areas except the Lake States and the Southeast. Average impact on *developed land prices* was about \$274 per acre (0.6%). The authors note that, in the Mountain, Northern Plains and Southern Plains, land prices were considerably lower than the national average, and land productivity on average was lower as well and speculated that the CRP contract offers a more profitable alternative in these regions than farming, all things equal.

Wu and Lin (2010) decomposed estimates of the effects of CRP on farmland values by region into the value of agricultural returns, the growth premium, and the option value. The Northern Plains incurred the strongest CRP effect on the value of agricultural returns, about \$42 per acre (12%). On the other hand, the presence of CRP expressed a dampening effect, as hypothesized, on the growth premium (14%) and option value (5%) in the Northern Plains. The authors speculate that this was likely due to the absence of developmental pressures on land prices in the sparsely populated region.

A related study by Chamblee et al. (2011) investigated the impact of more permanent conservation forms (e.g., easements, land trusts, fee simple acquisition) on values of surrounding parcels using data from a county in North Carolina. Their findings suggest that the effects of private land conservation on surrounding land prices vary by type of conservation. Their study did not directly address federally sponsored programs such as CRP.

Profiling Producers Enrolled into CRP

Several studies investigated the characteristics, motivations, beliefs, and attitudes of CRP contract holders³. Unlike the emphasis in a majority of studies reviewed in Lesch and Wachenheim (2014), none of the CRP- specific literature considered the impact of these different factors on value of CRP to the landowner or on their likelihood of (re)enrolling in CRP contracts. In fact, because choices with tradeoffs were not explicitly investigated, the work considered here may overstate the importance of various factors to the landowners and in general does not allow estimation of the relative importance of their priorities. One exception is Lambert et al. (2006a; 2006b) who predicted the likelihood of participating in a land retirement program.

Predicting Enrollment

Lambert and Sullivan (2006), Lambert, et al. (2006a; 2006b), Lambert, et al. (2007); and Lambert, Sullivan and Claassen (2007) examined land retirement programs along with working-land, structural and vegetative conservation practices, and conservation-compatible practices. Data was drawn primarily from the USDA's Agricultural Resource Management Survey (ARMS) of 2001-2003. The sample was limited to family farms (accounting for 98% of all farms and 94% of all farmland in 2003), but excluded cooperative and corporate farms. Factors important in the choice to participate in working lands and land retirement programs, the percentage of acreage enrolled in CRP/CREP/WRP, and the number of conservation structures adopted were reviewed in Lesch and Wachenheim (2014). Those important to land retirement programs are highlighted here.

The *presence of a land retirement program* was shown to be inversely related to high value crops, but positively related to ownership of the parcel. Use of a land retirement program was also linked positively with owning land classified as highly erodible. No association was found between use of land retirement and off farm income/total household income, proximity to a stream, or gross income net of government payments.

Presence of grain crops was found to be inversely related to the *percentage of land enrolled in CRP/CREP/WRP*. Ownership of the land, government payments, and the presence of a female operator were all found to be positively associated with the occurrence of CRP/CREP/WRP. No association was established between percentage of land enrolled in a retirement program and high value crops, household size, a farm birthright, location proxemics to a water source or environmentally sensitive land, or the presence of a highly erodible land index.

³ Earlier studies of CRP holders were conducted by McLeod, Miller and Perry (1998-1999) in the state of Oregon; Hatley, Ervin, and Davis (1989) in the High Plains of Texas; Onianwa, Wheelock, and Hendrix (1999) and Onianwa et al. (1999) in Alabama; Kalaitzandonakes and Monson (1994) in Missouri; McLean-Meyinsse, Hui, and Joseph (1994) in Louisiana; Gustafson and Hill (1993) and Hodur, Leistritz, and Bangsund (2002) in North Dakota, and Allen and Vandever (2003) in South Dakota. With the exception of the ND and SD studies, these are not addressed in detail here given the disparity between decision drivers today, and those likely factors in the earlier years of the program.

Bidding Behavior

Several studies have looked at the CRP bidding process. Initially, the maximum acceptable bid for a parcel of land and the amount of land which would be accepted into the program were unknown to landowner-bidders. Overtime, landowners increased their bids as additional information became available (Shoemaker, 1989; Reichelderfer and Boggess, 1988; Kirwan, Lubowski and Roberts, 2005).

Research findings suggest that landowner bids are also responsive to the Environmental Benefits Index (EBI) (Vukina, Sehng and Marra, 2008; Kirwan, Lubowski and Roberts, 2005), especially among those in high-rent areas (Jacobs, Thurman and Marra, 2011) and that high rent area landowners tended to offer a larger discount (lower bid relative to the maximum bid) than did landowners from lower rent areas. The marginal effect of the Conservation Priority Area was also greater in high rent areas, and in general, landowners considered those points earned due to location in the PPCPA to be more important in environmental impact than other points comprising EBI

Vukina, Zheng and Marra (2008) looked at bidding behavior when the exogenously determined environmental benefits index and the endogenous bid were both considered in bid acceptance. In the bidding process, preference is allotted to lower bids for land with a higher EBI. The study was conducted using data for North Carolina for the first signup since the environmental scoring rubric was introduced and producers therefore faced considerable uncertainty about bid acceptance. In addition to considering EBI when bidding, landowners considered the longer term productivity effects of conservation practice on their farm; and hence offered reduced bids, concurring with findings of Marra and Vukina (1998) and Vukina et al. (2008). It also concurred with Hodur, Leistritz, and Bangsund (2002) who found improved soil productivity to be a decision factor for enrollment among North Dakota farmers. To the contrary, Miranda (1992) found this benefit was not fully considered in landowner bids.

Producer Attitudes, Perceptions and Intentions

Allen and Vandever (2003) employed a national survey of CRP contractees to examine a range of factors associated with adoption, maintenance, use, and other outcomes associated with the program. Despite its early administration, it represents the most comprehensive approach to date. Some 1,400 usable responses resulted from an FSA-generated sample of approximately 2,200 contractees delivered via a mail survey instrument. The sample drawn was proportional to the incidence of regional CRP contracts.

Contract holders were asked their opinions on a range of environmental and social benefits associated with the program. Control of soil erosion (mentioned by 85% of respondents), wildlife population management (73%), and the opportunity to view wildlife (59%) were the most often identified benefits. Approximately 80% of respondents reported that the weight attached to maintenance or improvement of wildlife habitat was appropriate; fewer than 10% in any region suggested too much emphasis was applied here. Improved water quality (39%), opportunities to personally hunt (38%), and scenic improvements to the farm or landscape (37%) also received mention by more than one third of respondents. Control of drifting snow (30%), improved air quality (29%), greater permanence to surface water (24%), potential increase in future income (17%), and increase in opportunity to lease land for hunting (12%) were also mentioned.

Although roughly 25% of contractees reported no negative effects from the CRP, others reported CRP as a source of weeds (mentioned by 29% of respondents), a fire hazard (19%), or as a source of unwanted requests for hunting (18%). Appearance (unkempt; 13%), the attraction of unwanted wildlife (9%), and negative effects on the local economy (8%) were mentioned along with reduction in production lands (4%).

Management of CRP by the contractees differed by region. For example, those respondents from Mountain states clearly preferred grazing over alternatives (63%), compared with those in the Corn Belt whose interest in grazing could be described as less than lackluster (10%). Most respondents were, at that time, satisfied with the range of management alternatives available, although a significant number would have preferred more intensive management with an increased level of payment.

At the state level, early research by Gustafson and Hill (1993) provided detailed insights into post-CRP land uses among North Dakota contractees. A mail survey of contractees resulted in a pool of 351 usable instruments (39% response rate). Most respondents were older (60% > 55; one third >60), with about one-third of contractees residing at the location of the CRP. An additional 39% lived within five miles of the parcel(s), and another one-fifth resided between 5 and 20 miles. The most prevalent planting prior to entry into CRP was wheat (60%), followed by barley (14%). Reported rationale for CRP enrollment is shown in Table 1, led by risk management and concern for soil erosion.

Table 1. Reasons respondents enrolled in CRP

<u>Reasons for Enrolling</u>	<u>Percentage Responding</u>		
	<u>Agree</u>	<u>Uncertain</u>	<u>Disagree</u>
Low risk	81	10	9
Concern for soil erosion	79	9	12
Provide wildlife habitat	71	14	15
Most profitable use	67	23	10
No new farm equipment	56	14	30
Meet conservation compliance	48	20	32
More free time	46	15	39
Close to retirement	44	11	45

Source: Gustafson, C and CL Hill (1993) Future Land Use Decisions of North Dakota Conservation Reserve Program Participants, Department of Agricultural Economics, Agricultural Experiment Station, North Dakota State University, page 9 (table 7) (revised).

The authors investigated business-related factors contributing to the decision to participate, and found that the leading component was avoidance of additional equipment investments (47%), followed by increased income (38%) and avoidance of debt (37%). Stated intentions for post-CRP use were led by return to cropping (52%), rental for farming purposes (21%), and use of the property for grazing or haying (18%). Sale of the land was mentioned by only four percent. On the side of inputs, use of CRP allowed for diversion of labor to other farm activities (61%), and freed time for leisure/family (29%) while also reducing the need for hired labor (26%) and enabling off-farm employment (25%). The decision to farm post-CRP was largely an economic one in that producers saw it as increasing income

(65%; very important), with concerns for soil erosion (51%; very important) and loss of steady stream of income (49%; very important) also highly ranked as self-reported. The range of beliefs concerning CRP can be found in opinion statements of the day, shown in Table 2. Most producers/contractees were desirous of contract extensions for 10 years, with more than half interested in permanent CRP agreements (57%). However, nearly two-thirds sought to grow crops on CRP parcels (63%), with nearly one-half (44%) reporting that they would condition their CRP decisions on commodity prices. The average percentage of CRP payments that went to farm debt retirement was about 39, with about 17% allocated to leisure/family lifestyle.

Table 2. Distribution of responses on attitude questions

<u>Attitude Questions</u>	<u>Responses</u>		
	<u>Agree</u>	<u>Uncertain</u>	<u>Disagree</u>
Extend contracts 10 more years	84	14	2
Take reduction in CRP payment	12	29	59
Reduction in payments but allowed to hay/graze CRP land	40	28	32
Want permanent CRP contract(s)	57	28	15
Grow crops on CRP land	63	27	10
Raise livestock on CRP land	26	36	38
Retire after CRP contract(s) expire	27	28	45
Inclined to enroll in CRP if payments decrease	55	28	17
Less inclined to enroll in CRP again if ag commodity prices increase	44	39	17
Inclined to enroll in CPR again if more off-farm jobs available	17	27	56
Condition of farm equipment will affect re-enrollment decision	30	21	49
Stay in CRP to pay off debt	24	11	65

Source: Gustafson, C and CL Hill (1993) Future Land Use Decisions of North Dakota Conservation Reserve Program Participants, Department of Agricultural Economics, Agricultural Experiment Station, North Dakota State University, page 16 (table 16) (revised).

Hodur, Leistriz, and Bangsund (2002) conducted a comprehensive survey of landowner – CRP contract holders in 16 counties in ND; 13 of which are in the PPR. They obtained the list of CRP contract holders from the Farm Service Agency. The study also included personal interviews with, and a survey of, community leaders. Among contract holders, no single motivator emerged for enrollment, but economic reasons were the most common, concurring with the findings of Gustafson and Hill (1993). Economic reasons identified by Hodur, Leistriz, and Bangsund were disaggregated into its role in reducing income risk (23%) and otherwise providing an economic advantage (22%). The average combined total of the two varied by county group, ranging from 37% to 59%. The next most common motivator was reduced erosion / improved soil fertility (24%). Also noted was that CRP aided the transition to retirement. [Average age of respondents was 61 years; 45% were more than 65 years old.] Wildlife / hunting opportunities were not an important motivator among respondents. Hunting opportunities were mentioned by only two percent and, of these, 82% were not farmers and 75% had less than 150 acres enrolled.

Importance of motivators differed by respondent age and size of operation. Among those reporting their main reason to have enrolled in CRP to be retirement or career change, 64% were at least 65 years of age and 81% were at least 51 years old. Forty percent of respondents said that CRP helped them transfer to retirement. The remainder reported that CRP did not affect the transfer, sale or expansion of their operation. Soil issues were more important as a motivating factor for those with less than 150 acres enrolled than others. Economic benefits were more important to farmers with greater than 450 acres enrolled than to those with less than 150 acres enrolled.

Looking to the future, 88% of respondents indicated they would re-enroll at least some of their CRP acreage. Eighty-three percent would do so even if cash rental rates exceeded CRP payments, 72% indicating at least 75% of their land under this condition. Eighty percent indicated they would re-enroll all enrolled acres. Of the 12% who would not re-enroll any land, 68% would convert some to crop production (43% would convert all to crop production). Thirty-four percent indicated they would convert some to hay.

Contract holders were asked about the benefits of CRP. Fifty-nine percent said it was important (very or somewhat) for removal of marginal lands from production and, separately, to provide a more stable income source. Seventy-two percent indicated it reduced income risk. Also income related, about one-third (separately) indicated it helped cover short- and long-term debt, provided income for family living expenses, and offset income losses on other cropland. Importance of these identified benefits did not differ much by locale. Three-fourths agreed that CRP is a cost-effective means to idle cropland (average response was 4.0 on a 1 = strongly disagree and 5 = strongly agree Likert scale). They agreed it helped with soil erosion on marginal cropland (4.5), reduced flooding (3.9) and improved water quality in adjacent areas (3.9).

Local leaders noted positives of CRP to be the guaranteed income and that this had often met or exceeded cash rent opportunities; environmental effects (water, soil, wildlife); and that, because haying had been allowed during severe droughts, the presence of CRP offered a more stable feed supply.

Contract holders agreed that CRP benefits farmers and sportsmen (recreation and wildlife). Hodur, Leistriz, and Bangsund noted that evidence suggests that CRP enhances wildlife habitat and therefore upland game bird and waterfowl populations which, in turn, increases recreational opportunities. A strong majority of farmers said CRP increased wildlife presence and had a positive effect on hunting. And, in spite of some general concern that CRP contract holders are more likely to post their land, 89% of contract holders reported they had not changed their posting behavior from pre-CRP. Seventeen percent reported they participated in the Private Lands Open to Sportsmen (PLOTS) program. The most prevalent reasons for not participating were that they were not familiar with the program (41%), that they already had an established cover crop (25%), and that the financial incentive was not adequate (24%).

Negatives noted by *local leaders* regarding CRP included the impact on the farm-supply sector, increased weed pressure, and effect on rural population and farm numbers. Hodur, Leistriz, and Bangsund noted that 42% of contract holders had less than 150 acres (not generally a viable size farm) somewhat mitigating the concern regarding the impact of CRP on farm-acreage numbers. Also, a larger percentage

of respondents among those farming (31%) reported CRP was instrumental in keeping them on the farm than of those no longer farming who said CRP influenced their decision to stop farming (23%).

Contract holders were asked what changed as a result of their enrollment in CRP. Overall, farmers reported no change in input costs and that yields were approximately five percent less. Few reported changing farming practices (machinery, labor, and management). Eighty-three percent reported they did not change cropping practices on adjacent acres. However, a majority reported adopting minimum no-till and retention of grass in drainage areas. Some also indicated they made changes to support wildlife. Reduction in hired labor, family labor, and machinery were reported by 22%, 41%, and 33% of respondents, respectively.

Farmers were asked what the CRP contract should include. Almost half (48%) agreed more land should be enrolled in CRP (31% were neutral and 22% disagreed). Fifty-five percent thought the focus should be on marginal farmland (versus wildlife) (22% were neutral and 24% disagreed).

Local leaders were also asked for their recommendations for the CRP program. They suggested that: 1) the program should focus on highly erodible land as they generally believed there was, at the time, too much productive land in the program; 2) periodic haying be allowed, and that haying be allowed earlier in the season to improve hay quality; and 3) recreational access to CRP acres (mostly hunting) be increased to offset economic losses to communities from land being in CRP. Other suggestions were to change incentives / enforcement mechanisms to improve weed control; make the enrollment process more efficient; consider that the program punishes those landowners already practicing environmentally-oriented management (e.g., not farming unsuitable land); provide permanent land retirement under CRP, and decrease acreage enrolled in any given area.

Janssen et al. (2008) surveyed just under 800 South Dakota CRP participants. Those with contracts were older (61 versus 53 years) and operated smaller farms (74% reported < \$100,000 annual income) when compared to all South Dakota producers. About one-third (37.5%) reported farming as their main occupation, with the remaining respondents split between retired, or non-farm business/off-farm employment. The majority (93%) of those reporting their status as non-farm or retired operated small farms. The main source of income for a majority of those retired (87%) and nonfarm (63%) was rental income from the farm (including CRP). For these, CRP accounted for about one-third (30%) of total acres held. Retirees and nonfarm participants held about 57% of CRP acres, while small farm operators accounted for an additional 18% of acreage, with the remainder (about 25%) held by medium and large farm operations.

Respondents reported that about one-third (34%) of acres were destined for re-enrollment (“very likely”), and about 29% of acreages were “somewhat likely” to be re-enrolled. More than one-third (37%) were “not likely” to be re-enrolled. In scenario analyses, those intending re-enrollment sought the smallest added rental payment (\$16/acre), whereas those intending to convert to cropland sought an average increase of some \$28/acre for retention. Planting of corn and soybeans was mentioned most often (44% of acres) if conversion were to occur, followed by wheat (35%). Those with livestock-related intentions post-CRP reported a range of necessary improvements (to varying degree), with only about one-quarter suggesting the CRP would be ready for grazing. Fencing repairs (36%), the establishment of

fences (59%), and/or the establishment of water sources (34%) received the most mentions as limitations for livestock grazing on CRP acres.

At the state-level, the most recent profiling of CRP contract holders and their uses/intentions toward CRP is found in the work of Atkinson, Romsdahl and Hill (2011) who considered factors influencing past land use intentions for CRP-enrolled land in three North Dakota counties contained within the PPR. Forty-three, and thirty percent of respondents reported profit-influencing factors of market prices and the expected cost of production, respectively, would be very important. Cost sharing opportunities were also noted as important. In addition to rents not competitive with local rental rates, other hurdles included those associated with the lack of program fit for the local area, government bureaucracy associated with enrollment, and non-competitive rental rates. Conclusions call for making information about programs and their implementation, especially as relevant to the individual producer, more available to landowners. As 79% of respondents reported getting information from FSA, Atkinson, Romsdahl, and Hill recommended FSA and NRCS work to increase access to and relevance, clarity and completeness of the information available to landowners and work on a more aggressive outreach plan.

Contract holders' views on CRP land use for recreation

Allen and Witter (2008) elicited CRP contract-holders' views on the use of CRP parcels for recreation, and the economics of recreational access. Using a proportional, stratified sampling design, CRP contractees were sampled nationwide during fall, 2007. The final sample of about 2,900 farmers represented a response rate of some 74%, with weighting used to restore the proportional sample representation. Findings revealed that more than one-half (57%) of producers allowed some portion of their CRP to be used by others for recreational purposes. When others were queried as to why their land was not in use for recreation, one-half stated an opposition to property access by those unknown to the landowner, and 38% reported that they simply were not asked. More than one-half of respondents related hunting concerns, i.e., they themselves did not have adequate hunting property, and/or the CRP land was too close to house/farm/livestock to permit hunting. Outside of family and friends, 44% reported providing access to eleven or more persons during the last year, with about 56% reporting access requests from one to ten persons. By far, the most common reason for access was hunting (89%), with nearly half (44%) reporting use for wildlife viewing. Users were reported by 78% of contract holders to include those local to the community; 39% reported users to include those from within the state but outside the local area; and 22% reported users to include those from out of state.

The survey also revealed that about 5% of CRP contractees received some form of income for affording access. Among those not receiving such income, approximately 40% reported that they did not believe that fees should be charged for hunting or other recreation; and about one quarter (26%) reported that they lacked sufficient land to lease for hunting. Among the 100 responses from those charging a fee, most (70%) charged a one-time, upfront fee, and nearly one-fifth (17%) revealed that their CRP was enrolled in a state-operated "walk-in" access program. Nearly two-thirds (62%) of those who obtained fees for CRP-enrolled land use also leased other non-CRP lands for hunting or other recreational use. Seventy percent of respondents indicated that the presence of CRP on either the landowners' or neighbors' lands did not influence their decisions about access.

The average fee charged before CRP status was obtained was just under \$2 per acre (\$1.90); post CRP, the average charge per acre was \$6.13. If their land was no longer to be enrolled in CRP, owners were approximately evenly divided as to whether or not they would continue to obtain recreational use income. Use of CRP for recreation reportedly varied somewhat by region, with the Plains- and Western-states reporting the lowest levels of access (51%; 53%), and the East- and Midwest- states the strongest (58%; 61%). Eastern states were most likely to obtain a fee for use (19%), followed by Plains (16%), Western (11%) and Midwestern (4%) counterparts. The authors concluded by estimating that nationally, the net additional funds received by CRP holders (from access), was slightly in excess of \$21 million.

Summary

The Conservation Reserve Program, one of more than twenty voluntary conservation programs, began under the 1985 Farm Bill and has evolved under subsequent farm bills. Today, enrollment acres are selected among qualifying land based on an environmental benefits index, which includes the landowner's bid. During the life of the 2014 Agricultural Act, maximum enrollment (ceiling) will drop from 32 million to 24 million acres.

This report discussed findings from the literature regarding CRP. Three studies examining the impact of commodity prices on CRP enrollment and one modeling CRP extensions under varying levels of rental payments and with and without grazing allowed were reviewed. This literature and that reviewed by Lesch and Wachenheim (2014) emphasized the importance of economic factors in conservation decisions, an importance that has grown as technology has increased and improved production opportunities. These same technologies have mitigated the efficacy of CRP towards conservation objectives due to slippage.

Three studies investigating the effect of CRP on the value of CRP-enrolled and surrounding land were included in the review. The literature suggests a positive effect, but there is conflicting evidence about whether landowners (fully) consider the positive impact of enrollment on future soil productivity when bidding. The literature provides evidence of learning from previous landowner enrollment bidding, and that bidding behavior differs between high-rent lands and others. Discounts offered by landowners (the difference between their bid and the maximum bid) have been shown to be larger for higher-rent lands, but there is also evidence that owners of these lands are more responsive than others to changes in the maximum rental rate and in environmental benefits index scoring.

This report also considered literature profiling producers enrolled in CRP. Lambert and Sullivan (2006) and subsequent papers offered the only research reviewed with the specific objective of identifying factors contributing to CRP participation⁴. Lambert and Sullivan found the presence of a land retirement program to be directly related with land ownership and the presence of highly erodible land and indirectly related with production of high value crops. They found the percentage of land enrolled in a land retirement program to be negatively related to the presence of a grain crop and positively related to farm ownership, participation in other government programs, and the female gender.

One national and five state-level studies investigating the characteristics, motivations, beliefs, and attitudes of CRP contract holders were also reviewed. This literature in general may suffer from what we term "agreement bias". By some form of query, respondents were asked about the level of importance of various factors to their decision-making regarding CRP. Because they were not asked to rank factors or otherwise prioritize them, there was substantial agreement among respondents that many economic and environmental factors were important. There were, however, some general trends. An early national survey identified environmental advantages to be most important and also identified non-financial disadvantages such as the effect on the local economy, weeds, unwanted wildlife, and an unkempt appearance. Alternatively, five studies covering the Dakotas in general identified economic

⁴ This work was reported in multiple publications including Lambert and Sullivan (2006), Lambert et al. (2006a, 2006b), Lambert, Sullivan, and Claasen (2007) and Lambert et al. (2007).

factors as the most important, although respondents also identified environmental contributions and other factors including but not limited to farm transition, effect on machinery needs, and time for off-farm employment and leisure. Several of these studies, most recently Atkinson, Romsdahl and Hill (2011), and the work of Lesch and Wachenheim (2014) concluded that the decision-making process by landowners would benefit from additional information about the program that is specific to their situation. Finally was consideration of literature that looks at enrollee views on the use of CRP parcels for recreation and recreational access. Allen and Witter (2008) found that a slight majority allowed access, most often for hunting and that few received payment for doing so, although those receiving payment saw that payment triple under CRP. Willingness to allow access differed by region and was not reported to have changed by the presence of CRP on their or on neighboring land.

Conclusions

Although most of the literature considering CRP enrollment response to changing economic conditions is dated and not reflective of current conditions, the currency of the message that landowners respond to financial incentives remains important. The literature in general suggests that significant increases in CRP rental rates would be required to maintain CRP enrollment in the recent market environment. And, in fact program rules accommodate this as the maximum bid rate is based on soil productivity and the associated average cash rent for the county; the latter of which generally reflects current market conditions. However, uncertainty about the costs and financial benefits appears to remain as one hindrance to enrollment that may otherwise be attractive to the landowner.

The literature is less helpful regarding the influence of non-financial factors on CRP enrollment. Research studies reviewed individually and collectively concluded that a host of factors are important; so many that it is difficult to distinguish between what is important and what is less, or not important. This can be attributed to the nature of the queries used to investigate landowner perceptions. To overcome this limitation of existing research, we propose the use of non-aided questions, particularly during face-to-face interviews, to help tease out those factors most important to specific decision-makers and eliminate those without a strong influence on landowner choice. Further, rather than asking landowners to eliminate factors that they do not consider or minimally consider in the decision (few are actually eliminated), it may be valuable to ask them to identify those that are most important and to rank or otherwise prioritize them.

Lesch and Wachenheim (2014) concluded that important differences in farmer or farm structure characteristics may call for estimation of separate equations to explain conservation choices and that clearly targeted research objectives may better serve an identified audience than more generalized research over a more-broadly defined group of farms, farmers and locales. Limiting the investigation to the Conservation Reserve Program in part addresses these recommendations. However, it is important to recognize that a focus on a particular conservation practice and / or program may be limiting when considered in isolation if choices regarding conservation practices are not independent. That is, if we do not consider the availability of other conservation options and the potential presence of existing conservation or other efforts, we may find it difficult to explain what drives participation in a single program. It is also relevant whether a landowner is considering continued, not just initial, adoption, and this is a consideration largely lacking in the literature.

Research should account for slippage, which can lessen the impact of CRP and other conservation program enrollments on total enrollment acres. The consequence of enrollment into or opting out of the CRP is not acre-for-acre because of slippage. This should be explicitly considered during study design if research objectives are different than simply predicting or explaining enrollment in CRP (e.g., if the research objective is to predict the effect of a policy or other external change on total conservation acres) in a locale.

One overwhelming message stemming from this review and that of Lesch and Wachenheim (2014) is to educate decision-makers on all aspects of conservation program options likely to influence their enrollment decision accurately, clearly, and using a venue that is accessible to them. Whenever possible, information provided focus on specifics such as the impact of a specific conservation practice locally and the likely economic impact of various options for the individual producer. And, it should stress economic factors, including those that may otherwise not be considered by landowners such as the impact of enrollment on value of that land, or of adjoining parcels and on value for fee-hunting.

We should look for innovative, efficient methods to increase farmer access to this information to include social networks and peer education. What matters most to the target audience should be emphasized and, what they fear, addressed. This implies knowing these factors and developing communication strategies responsive to the same. It will also be helpful to work on relationships between farmers and external stakeholders so that each better understands and can empathize with the situation of the other.

Bibliography

Allen, TG and DJ Witter (2008) Recreational Use & Economics of Conservation Reserve (CRP) Acreage: A National Survey of Landowners, Prepared for USDA Farm Service Agency by Southwick Associates, Inc. & D.J. Case & Associates.

Allen, AW and MW Vandever (2003) A National Survey Of Conservation Reserve Program (CRP) Participants On Environmental Effects, Wildlife Issues, And Vegetation Management On Program Lands. Biological Science Report USGS/BRD/BSR-2003-0001.

Atkinson, L, RJ Romsdahl, and MJ Hill (2011) Future Participation in the Conservation Reserve Program of North Dakota, *Great Plains Research* 21(2): 203-214.

Chamblee, JF, PF Colwell, CA Dehring, and CA Depken (2011) The Effect of Conservation Activity on Surrounding Land Prices. *Land Economics* 87: 453–72.

Cooper, JC and CT Osborn (1998) The Effect of Rental Rates on the Extension of Conservation Reserve Program Contracts, *American Journal of Agricultural Economics* 80(1): 184-194.

Environmental Working Group. Farm Subsidies,
http://farm.ewg.org/progdetail.php?fips=00000&progcode=total_cr (accessed February 12, 2014).

Farm Service Agency. Conservation Reserve Program: Status – End of December 2013,
http://www.fsa.usda.gov/Internet/FSA_File/dec2013onepager.pdf (accessed February 12, 2014).

Farm Service Agency. Conservation Reserve Enhancement Program,
<https://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=cep> (accessed February 12, 2014).

Gill-Austern, D (2011) The Impact of Rising Corn Prices on the Conservation Reserve Program: An Empirical Model, *Undergraduate Economic Review* 7(1, Article 22). Available at:
<http://digitalcommons.iwu.edu/uer/vol7/iss1/22>

Gleason, RA, MK Laubhan, and NH Jr Eulis, eds. (2008) Ecosystem services derived from wetland conservation practices in the United States Prairie Pothole Region with an emphasis on the U.S. Department of Agriculture Conservation Reserve and Wetlands Reserve Programs: U.S. Geological Professional Paper 1745, 58 p.

Gustafson, C and CL Hill (1993) Future Land Use Decisions of North Dakota Conservation Reserve Program Participants, *Agricultural Economics Reports* 23191, Agricultural Experiment Station, North Dakota State University.

Hatley, M, RT Ervin, and B Davis (1989) Socioeconomic Characteristics of Participants in the CRP: Texas High Plains, *Journal of Soil and Water Conservation* 44(5): 510-512.

Hellerstein, D and S Malcolm (2011) The Influence of Rising Commodity Prices on the Conservation Reserve Program. U.S. Department of Agriculture, Economic Research Service, Economic Research Report No. ERR-10, Washington, D.C. (February).

Hodur, NM, FL Leistritz, and DA Bangsund (2002) Local Socioeconomic Impacts of the Conservation Reserve Program. Agribusiness and Applied Economics Report No. 476, North Dakota State University, <http://purl.umn.edu/23551>.

Jacobs, K, W. Thurman, and M Marra (2011) How Farmers Bid into the Conservation Reserve Program: An Empirical Analysis of CRP Offers Data. Paper prepared for presentation at the Agricultural and Applied Economics Association's 2011 AAEA and NAREA Joint Annual Meeting, Pittsburgh, Pennsylvania, July 24-26, 2011.

Janssen, L, N Klein, G Taylor, E Opoku, and M Holbeck (2008) Conservation Reserve Program in South Dakota: Major Findings from 2007 Survey of South Dakota CRP Respondents, Economics Research Report 2008 – 1, <http://econ.sdstate.edu/Research/CRP2008.pdf>.

Kalaitzandonakes, N and M Monson (1994) An Analysis of Potential Conservation Effort of CRP Participants in the State of Missouri: A Latent variable Approach, *Journal of Agricultural and Applied Economics* 26(1): 200-208.

Kirwan, B, R Lubowski, M Roberts (2005) How Cost-Effective are Land Retirement Auctions? Estimating the Difference between Payments and Willingness to Accept in the Conservation Reserve Program. *American Journal Agricultural Economics* 87(5): 1239-1247.

Lambert D and P Sullivan P. (2006) Land Retirement and Working-land Conservation Structures: A Look at Farmers' Choices. *Amber Waves* 4(3): 16-21.

Lambert, DM, P Sullivan, R Claassen, and L Foreman (2006a). Use of Conservation-Compatible Practices Varies by Farm Type. *Amber Waves*, 4(1): 7.

Lambert, D, P Sullivan, R Claassen, and L Foreman (2006b) Conservation-Compatible Practices and Programs: Who Participates?, *Economic Research Report 14: 1-43*, Economic Research Service, United States Department of Agriculture.

Lambert, D, P Sullivan, R Claassen, and L Foreman (2007) Profiles of US Farm Households Adopting Conservation-Compatible Practices, *Land Use Policy* 24: 72-88.

Lambert, D, P Sullivan, and R Claassen (2007) Working Farm Participation and Acreage Enrollment in the Conservation Reserve Program, *Journal of Agricultural and Applied Economics* 39(1): 151-169.

Lawley C (2013) Changes in Implicit Prices of Prairie Pothole Habitat, *Canadian Journal of Agricultural Economics* 00: 1-20, DOI:10.1111/cjag.12022.

Lesch, WC and CJ Wachenheim (2014) Factors Influencing Conservation Practice Adoption in Agriculture: A Review of the Literature. *Agriculture and Applied Economics Report No. 722*, North Dakota State University, Fargo.

Lichtenberg, E and R Smith-Ramírez (2011) Slippage in Conservation Cost Sharing, *American Journal of Agricultural Economics* 1-17.

Lin, H and JJ Wu (2005) Conservation Policy and Land Value: The Conservation Reserve Program, Paper presented at the American Agricultural Economics Association Annual Meeting, Providence, RI, July 24-27.

Marra M and T Vukinaa (1998) The Conservation Benefit-Cost Trade-off in the Conservation Reserve Program, Paper presented at the World Congress of Environmental and Resource Economists, Venice, Italy, June 24-27.

McLean-Meyinsse, PE, J Hui, and R Joseph (1994) An Empirical Analysis of Louisiana Small Farmers' Involvement in the Conservation Reserve Program, *Journal of Agricultural and Applied Economics* 26 (2): 379-385.

McLeod, D, S Miller and G Perry (1998-1999) Opportunities for Efficient Agricultural Policy and Producer Decision Making: A Comparison of the Returns to Oregon Dryland Wheat Production with Conservation Reserve Program Payments, *Journal of the ASFMRA*: 70-77.

Miranda, M (1992) Landowner Incorporation of Onsite Soil Erosion Costs: An Application to the Conservation Reserve Program, *American Journal of Agricultural Economics* 74: 434:443.

Niemuth, ND, FR Quamen, DE Naugle, RE Reynolds, ME Estey, and TL Shaffer (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 United States Department of Agriculture Farm Service Agency, available at http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_013055.pdf (accessed September 12, 2013).

Niemuth, ND, AL Dahl, ME Estey, and CR Loesch (2007) Representation of Landcover along Breeding Bird Survey Routes in the Northern Plains, *the Journal of Wildlife Management* 71(7): 2258-2265.

Onianwa, O, G Wheelock, and S Hendrix (1999a) Factors Affecting Conservation Practice Behavior of CRP Participants in Alabama, *Journal of Agribusiness* 17(2): 149-160.

Onianwa, OO, GC Wheelock, MR Dubois, and ST Warren (1999b) Assessing the Retention Potential of Conservation Reserve Program Practices in Alabama, *Southern Journal of Applied Forestry* 23(2): 83-87.

Rashford, B, J Walker, and C Bastian (2010) Economics of Grassland Conversion to Cropland in the Prairie Pothole Region, *Conservation Biology* 25(2): 276-284.

Reichelderfer, K and W Boggess (1988) Government Decision Making and Program Performance: The Case of the Conservation Reserve Program, *American Journal of Agricultural Economics* 70(1): 1-11.

Reynolds RE, CR Loesch, B Wangler, and TL Shaffer (2007) Waterfowl Response to the Conservation Reserve Program and Swampbuster Provision in the Prairie Pothole Region, 1992-2004, United States Fish and Wildlife Service, available at: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_013153.pdf (accessed September 12, 2013).

Secchi, S and BA Babcock (2007) Impact of High Crop Prices on Environmental Quality: A Case of Iowa and the Conservation and Reserve Program. Working Paper 07-WP 447, Center for Agricultural and Rural Development, Iowa State University, Ames, IA.

Shoemaker, R (1989) Agricultural Land Values and Rents under the Conservation Research Program. *Land Economics* 65: 131-137.

Soil and Water Conservation Society and Environmental Defense Fund (2008) Conservation Reserve Program (CRP) Program Assessment, http://www.swcs.org/documents/filelibrary/CRPassessmentreport_3BEFE868DA166.pdf (accessed December 30, 2013).

Stubbs, M (2012), Conservation Reserve Program (CRP): Status and Issues, Congressional Research Service, (October 18), R42783, 16 pages.

Stubbs, M (2013), Agricultural Conservation: A Guide to Programs, Congressional Research Service, (February 5), R40763, 27 pages.

Suter, J, G Poe, and N Bills (2008) Do Landowners Respond to Land Retirement Incentives? Evidence from the Conservation Reserve Enhancement Program, *Land Economics* 84(1): 17-30.

United States Government Accountability Office. Agricultural Conservation: Farm Program Payments are an Important Factor in Landowners' Decisions to Convert Grassland to Cropland. GAO-07-10534. Washington, D.C.: September 2007.

Vukinaa, T, X Zheng, M Michele, and A Levy (2008) Do Farmers Value the Environment? Evidence from a Conservation Reserve Program Auction, *International Journal of Industrial Organization* 26(6): 1323–1332 (<http://dx.doi.org/10.1016/j.ijindorg.2008.01.001>).

Wright, Christopher and Michael Wimberly (2013) Recent land Use Change in the Western Corn Belt Threatens Grasslands and Wetlands, *Proceedings of the National Academies*, available at: <http://www.pnas.org/content/early/2013/02/13/1215404110.abstract> (accessed September 12, 2013)

Wu, J (2000) Slippage Effects of the Conservation Reserve Program, *American Journal of Agricultural Economics* 82(4): 979-992.

Wu, J and H Lin (2010). The Effect of the Conservation Reserve Program on Land Values. *Land Economics* 86: 1-21.