Rural Economic Effects of the Conservation Reserve Program in North Dakota

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The Conservation Reserve Program (CRP) was originally established in 1985 to take marginal and erodible crop land out of production and place it into permanent cover (U.S. Congress 1985). The primary objective of the program was to reduce soil erosion on highly erodible crop land, with secondary goals of reducing the supply of farm commodities, providing income support to participants, and improving environmental benefits (U.S. Department of Agriculture 1997). The Food, Agriculture, Conservation, and Trade Act of 1990 extended the CRP through 1995, but modified the program to place more emphasis on environmental benefits. In 1996, the Federal Agriculture Improvement and Reform Act again modified the program by assigning even greater emphasis on environmental and wildlife goals (U.S. Department of Agriculture 1997).

Since the most identifiable economic effects of the CRP have been directly linked to changes in agricultural activity, economic impact studies of the CRP have examined the effects of taking crop land out of production and placing it into permanent cover (Van der Sluis and Peterson 1994, Venhuizen 1996, Hamilton and Levins 1998). These analyses generally focused on the effects of reductions in agricultural inputs and reduced crop volumes on farm supply and agricultural service sectors. Few studies have examined the economic effects of increased recreational expenditures associated with the program.

The Conservation Reserve Program has created substantial amounts of wildlife habitat in the northern Great Plains, which has directly contributed to growing upland bird, waterfowl, and big game populations. Expanding wildlife populations have in turn led to more opportunities for wildlife-related recreation, primarily hunting, and to a lesser extent, wildlife viewing. The subsequent effects of the CRP on wildlife populations were not as readily identifiable during the first years of the program as they have been in more recent years. As such, the economic benefits of increased consumptive and non-consumptive recreational activities were not included in the economic impact studies conducted early in the program's history (Siegel and Johnson 1991). While some research has placed value on increased wildlife populations for small-game hunters and for non-consumptive wildlife viewing (Ribaudo et al. 1989, John 1994, Allen and Ekstrand 1995, Johnson et al. 1994), few studies have attempted to evaluate the net effects of reduced agricultural revenues and increased recreational expenditures attributable to the CRP (Siegel and Johnson 1991).

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OBJECTIVE

The purpose of this report is to evaluate the agricultural and recreational effects of the Conservation Reserve Program on rural economies in North Dakota.

METHODS

Foregone agricultural revenues and additional recreational expenditures were compared to determine the net economic effect of the CRP. Agricultural revenues that would have occurred on land enrolled in the CRP and recreational expenditures accruing to rural economies due to the program were estimated from 1996 through 2000.

Study Design

Sixteen counties, grouped into six areas, representing different geographical, agricultural, and natural resource characteristics in the state were selected for study (Figure 1). Each of the study counties has relatively high CRP participation, measured by total acreage and percentage of total crop land enrolled (Table 1). A survey of CRP participants in the 16 counties provided information on crops grown and relative yields on CRP lands prior to enrollment, post-CRP land use intentions, and information on recreational activities associated with the CRP (Hodur et al. 2002).

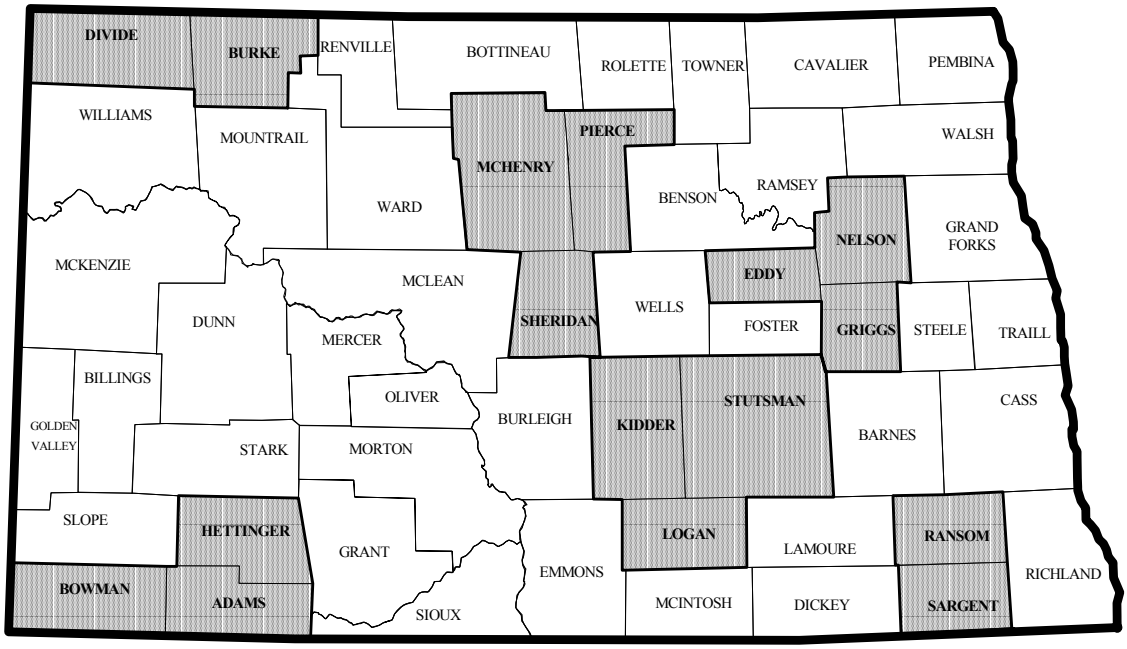

Figure 1. Counties and Multi-county Areas Selected for Assessing Effects of Conservation Reserve Program on Rural Economies

Table 1. Acreage Enrolled in Conservation Reserve Program, Study Counties, North Dakota, 1996 through 2000 Average

Study Counties	CRP Acreage	Percent of Crop Land
Adams	80,645	21.5
Bowman	69,750	20.8
Burke	51,049	11.2
Divide	83,996	15.1
Eddy	69,971	27.1
Griggs	68,092	21.4
Hettinger	107,885	18.7
Kidder	109,926	26.4
Logan	64,465	22.5
McHenry	117,369	17.2
Nelson	106,575	24.2
Pierce	77,640	17.5
Ransom70,518	19.6	
Sargent	41,148	10.2
Sheridan	61,123	18.0
Stutsman	178,645	18.1
Total	1,358,797	18.8
North Dakota	3,177,447	14.2
Study Counties as Percent of state	42.8	—

Source: Farm Service Agency (1997-2001a).

Agricultural Effects

Agricultural revenues that would have been generated on CRP lands from 1996 through 2000 were estimated using post-CRP land use intentions, adjusted crop yields, anticipated crop prices, and estimated government farm program payments.

Land Use

Hodur et al. (2002) reported how contract holders would use land currently enrolled in the CRP if the program was canceled or if contract holders either decided not to re-enroll or were prevented from re-enrolling in the program. The amount of CRP land that would return to crop production varied from nearly 82 percent in Ransom and Sargent Counties to 63 percent in Burke and Divide Counties (Table 2). Overall, 72 percent of CRP land in the study areas would return to crop production. Managing CRP tracts for hay production was the next highest post-CRP land use at 15 percent. The amount of CRP land used for hay production varied from 7 percent in Sargent and Ransom Counties to nearly 23 percent in Burke and Divide Counties. About 11 percent of land currently enrolled in the program would be used for livestock grazing and about 2 percent of land would remain in permanent cover without haying or grazing.

Table 2. Post-Conservation Reserve Program Land Use Intentions of Contract Holders, by Study Area, North Dakota, 2002

Study Counties	Post-CRP Land Use			
	Crop Production	Hay	Grazing	Permanent Cover
	%			
Adams, Bowman, Hettinger	66.7	17.4	10.4	5.4
Burke, Divide	62.6	22.8	12.6	2.0
Eddy, Griggs, Nelson	76.9	11.5	9.6	2.1
Kidder, Logan, Stutsman	71.4	18.1	9.3	1.1
McHenry, Pierce, Sheridan	68.0	15.0	15.3	1.6
Ransom, Sargent	81.8	6.9	9.4	1.9
Overall	71.7	15.1	10.8	2.5

Source: Hodur et al. (2002).

Crops Grown

Crops that would likely have been grown on CRP lands from 1996 through 2000 were estimated using the mix of crops raised on non-CRP lands over the same period (ND Agricultural Statistics Service 1997-2001). Crops, summer fallow, and prevented planting acreage which represented 3 percent or more of the study area's total planted acreage were included in the mix (Table 3).

Table 3. Estimated Crop Mix on Conservation Reserve Program Lands, by Study Area, North Dakota, 1996 through 2000

Crop	Adams Bowman Hettinger	Burke Divide	Eddy Griggs Nelson	Kidder Logan Stutsman	McHenry Pierce Sheridan	Ransom Sargent
	percentage of crop acreage					
Spring Wheat	55.3	14.0	38.1	43.9	39.5	35.2
Durum	9.8	53.6	5.5	6.2	8.5	--
Barley	4.0	4.7	18.2	9.9	13.8	--
Oats	3.8	--	--	5.0	4.1	--
Oil Sunflower	--	--	11.6	12.5	10.0	6.6
Non-oil Sunflower	--	--	5.5	--	--	--
Canola	--	--	3.9	--	5.3	--
Dry Beans	--	--	3.7	--	--	4.3
Corn	--	--	--	--	--	18.3
Soybeans	--	--	3.6	--	--	25.5
Alfalfa	14.8	3.7	5.1	16.7	9.8	4.4
Summer fallow	12.2	16.7	--	--	--	--
Prevented planting	--	7.3	4.8	5.9	9.1	5.8

Sources: ND Agricultural Statistics Service (1997-2001) and Risk Management Agency (2001).

Crop Yields

Because the CRP initially targeted marginal and highly erodible crop land, contract participants were asked to estimate how past crop yields on land enrolled in the program differed from yields on land not enrolled in the program. The yield differences reported by survey respondents were used to produce a yield differential for land enrolled in the CRP. Crop yields on non-CRP lands from 1996 through 2000 were adjusted by the yield differential to estimate crop yields on CRP lands (Table 4).

Hay and grazing yields from CRP land were based on typical CRP stands (i.e., grass/legume combinations), average precipitation, and less than average soil productivity for each study area (Sedivec 2002). The average hay yield included a 30 percent yield increase in year one due to collection of stand residue (Sedivec and Solseth 1998). Grazing output from CRP land assumed a 25 percent annual grazing efficiency (i.e., 50 percent disappearance of total forage, of which 50 percent is grazed and 50 percent is lost due to trampling, defecation, and senescence).

Table 4. Estimated Yield Differences on Post-Conservation Reserve Program Lands, by Study Area, North Dakota, 1996 through 2000

Post-CRP Land Use	Adams Bowman Hettinger	Burke Divide	Eddy Griggs Nelson	Kidder Logan Stutsman	McHenry Pierce Sheridan	Ransom Sargent
Yield Difference (%)[a]	-7.2	-7.1	-3.4	-1.7	-7.7	-6.2

[a] The percentage difference in past crop yields on land enrolled in the CRP compared to yields on land not enrolled in the program.
Source: Hodur et al. (2002).

Crop Prices

Estimating crop prices in the absence of the CRP is problematic. Several effects would be difficult to quantify, such as market price response to additional crop supply. Estimating crop prices in the absence of the program would require a separate study and was beyond the scope this project. Instead, the price effects of terminating the CRP were based on research conducted by the Food and Agricultural Policy Research Institute (FAPRI 2001). While the FAPRI research had some limitations, the research was accepted as the best information available. In addition, because the composition of farm program legislation in the absence of a conservation program and its effects on crop prices would be impossible to project, no attempt was made to estimate the price impacts of alternative government programs.

Based on FAPRI (2001), 5-year average prices received by farmers were adjusted by the following rates: wheat, non-oil sunflower, alfalfa, grass hay, and dry edible beans (-4.4%), barley (-9.9%), oats (-15.5%), soybeans, oil sunflower, and canola (-4.4%), corn (-10%). Due to the relatively large change in grass hay acreage, grass hay prices were reduced by 8.7 percent (twice the rate of alfalfa). Average pasture rental rates from 1996 through 2000 were assumed to be unaffected because the amount of post-CRP lands used for grazing (about 350,000 acres statewide) would only increase total pasture land in the state by 3.4 percent. The price effects estimated in this study were less than those estimated in previous studies (Lane and Reeve 1994, Heimlich and Osborn 1993, Diebel et al. 1996).

Government Payments

In the absence of the Conservation Reserve Program, farmers over the 1996 to 2000 period would have likely received some other type of government payment on land enrolled in the CRP. Predicting the composition of Federal farm programs in the absence of a Conservation Reserve Program is impossible; however, landowners would likely receive similar levels of farm program payments, even if those programs were structured differently.

Total farm program payments per county from 1996 to 2000 were determined (Farm Service Agency 1997-2001b). Production Flexibility Contract (PFC) payments and Market Loss Assistance (MLA) payments over the period represented direct payments to producers (i.e., those not tied to production). Other program payments per county (i.e., those tied to production) were estimated by subtracting PFC and MLA payments from total government payments.

Federal legislation allowed for PFC and MLA payments to be made on base acres, even if those lands were not cropped during the period (Swenson 2002). Therefore, in

the absence of the CRP, landowners would have received a PFC and MLA payment on the base acres of land enrolled in the program whether the land was idled, grazed, hayed, or cropped (Table 5). Government payments tied to production would only be received on CRP land returning to crop production.

Government payments were estimated using a method that allowed total MLA and PFC payments per county to be adjusted slightly upward to reflect additional base acres eligible for payment. Farm program payments tied to production were estimated for CRP lands that returned to crop production. In addition to farm program payments, prevented planting indemnities were included for each study area (Table 5).

Table 5. Estimated Annual Government Payments on Post-Conservation Reserve Program Lands placed into Crop Production, Hayland, Pasture, and Other Uses, and Estimated Crop Insurance Indemnities on Prevented Planted Acreage, North Dakota, 1996 through 2000

	Estimated Government Payment[a]		Prevented
Study Counties	Crop Production	Hay, Grazing & Other Uses	Planting Indemnities[b]
	---------- $/acre ----------		
Adams, Bowman, Hettinger	20.18	11.41	26.57
Burke, Divide	15.64	11.29	39.03
Eddy, Griggs, Nelson	31.59	17.44	36.30
Kidder, Logan, Stutsman	24.55	13.73	37.48
McHenry, Pierce, Sheridan	21.76	13.11	29.25
Ransom, Sargent	33.30	16.76	50.86

[a] Based on assuming the Conservation Reserve Program was terminated in the 1996 Federal Agriculture Improvement and Reform Act.
[b] Payment rates expressed as dollars for each acre of prevented planting.
Sources: Farm Service Agency (1997-2001b), Risk Management Agency (2001), and Swenson (2001, 2002).

Recreational Effects

The link between the Conservation Reserve Program and recreational activity is relatively straightforward. The CRP has created substantial amounts of wildlife habitat for a variety of game and non-game species (Feather et al. 1999). Increased habitat, combined with other factors, has led to increased wildlife populations. Abundant populations of game and non-game species have influenced the number of individuals participating in hunting and wildlife viewing activities in North Dakota. Accordingly, expenditures from those recreational activities have also increased. However, due to a lack of data describing wildlife viewing activities, only pheasant, waterfowl, and deer (firearm and archery) hunting activities were used to estimate the recreational impacts of the CRP. The role that the CRP has played in the change in hunter numbers was estimated based on wildlife population and licensing trends, secondary sources, and input from wildlife biologists.

License and Wildlife Trends

License sales, wildlife population, and game harvest statistics from 1975 through 2000 were compiled (ND Game and Fish Department 2001). Annual data were analyzed for differences in trends for 12 years prior to the CRP (i.e., 1975 through 1986) and for 14 years after the CRP (i.e., 1987 through 2000).

While the CRP was initiated in 1985, substantial acreage was not enrolled in North Dakota until 1987 (Figure 2) (Farm Service Agency 2000). Due to time lags between when agricultural land was converted into permanent cover and when wildlife populations responded to the increased habitat, wildlife populations did not increase as rapidly as program enrollment. Also, other factors, such as drought in the late 1980s, the 'wet weather cycle' during the 1990s, outbreak of mange on furbearer predators (i.e., primarily fox and coyote) in the 1990s, changing agricultural practices (i.e., continued shift to greater conservation tillage), establishment of food plots and development of key winter habitat areas, and weather during critical spring and winter periods[1] were all affecting wildlife populations during and after the surge in CRP acreage in the state. In addition, hunter participation initially lagged behind the rapid increase in CRP acreage in the state.

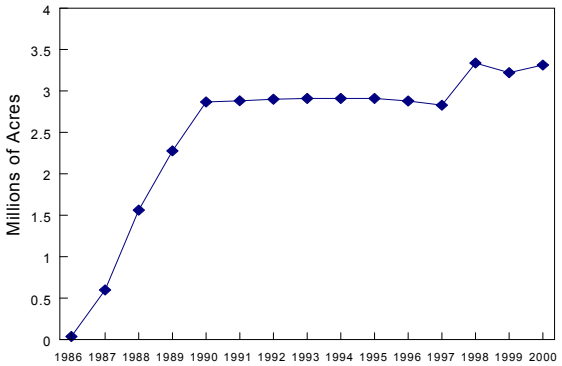

Figure 2. Cumulative Conservation Reserve Program Acreage, North Dakota, 1986 through 2000
Source: Farm Service Agency (2000).

[1]Weather has had both positive and negative effects on wildlife populations during the 1990s. Of particular importance was the severe winter of 1996-1997, which substantially reduced wildlife populations in many areas of the state.

Resident License Sales

Sales of general game and sportsman licenses (either of which represent a minimum requirement for most hunting in North Dakota) were combined to approximate the number of resident hunters in North Dakota. General game licenses sold trended lower from 1975 through 1986 (sportsman licenses became available in 1992) (Figure 3). License sales in the late 1980s were the lowest over the 26-year period examined. Resident general game and sportsman license sales have trended upward since the late 1980s, although some of the reason for the sharp upward trend from 1987 to 2000 can be attributable to the especially low hunter numbers during the late 1980s, when drought conditions were prevalent.

Trends in both pre- and post-CRP periods were analyzed for upland, waterfowl, and deer hunting. The pre- and post-CRP trends for firearm-deer licenses sold were similar and the number of firearm-deer hunters steadily increased from 1975 to 2000 (Figure 4). Resident and nonresident firearm-deer licenses were combined since nonresident firearm-deer hunter numbers are limited to 1 percent of resident firearm hunters in each hunting unit (ND Game and Fish Department 2001).

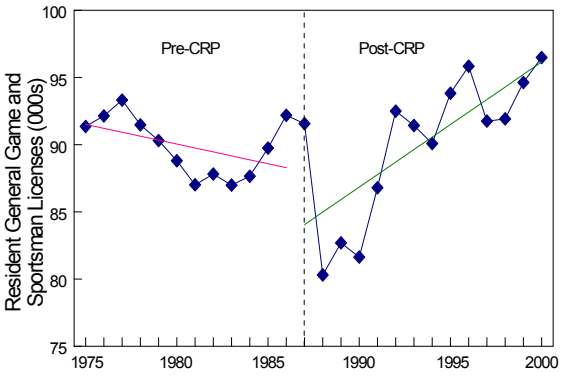

Figure 3. Resident General Game and Sportsman Licenses, North Dakota, 1975 to 2000
Source: ND Game and Fish Department (2001).

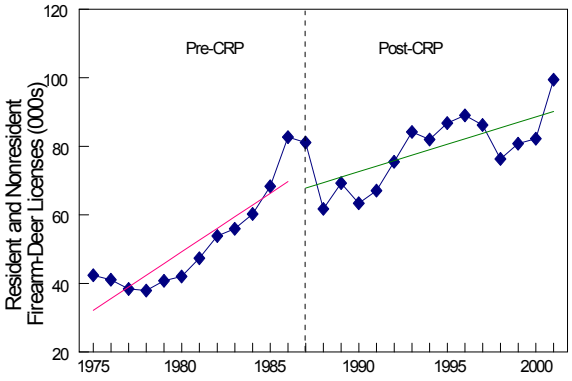

Figure 4. Resident and Nonresident Firearm-Deer Licenses, North Dakota, 1975 to 2000
Source: ND Game and Fish Department (2001).

The number of resident pheasant hunters was trending upward prior to the establishment of the CRP and has continued trending upward (Figure 5). Resident pheasant hunter numbers paralleled changes in statewide pheasant populations in the post-CRP period. Corresponding with high pheasant populations, pheasant hunter numbers peaked in 1992 (Tripp 1976-2001). Resident pheasant hunter numbers declined substantially after the harsh 1996-1997 winter that severely reduced pheasant populations in many areas of North Dakota.

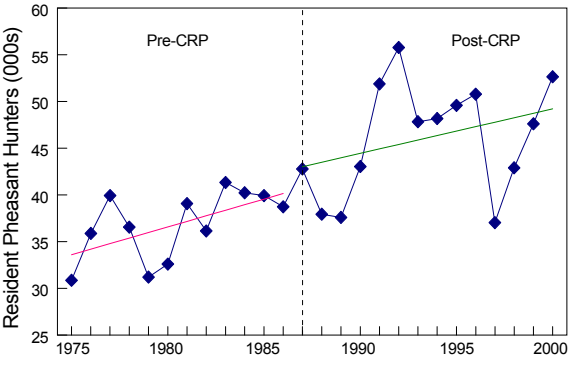

Figure 5. Resident Pheasant Hunters, North Dakota, 1975 to 2000
Source: Tripp (1976-2001).

In the late 1990s, pheasant populations rebounded, as did the number of resident hunters (Tripp 1976-2001).

For most of the 1975 to 2000 period, trends in the number of resident waterfowl hunters did not match any other resident or nonresident hunter patterns (Figure 6). A fundamental change in the number of resident waterfowl hunters occurred from 1975 through 1992. In 1975, the state had about 67,900 resident waterfowl hunters, in contrast, in 1992, the state had 22,800 resident waterfowl hunters. The dramatic decline in resident waterfowl hunters is likely due to a host of factors; however, identifying and analyzing those factors was beyond the scope of this report. In 1993, hunter numbers began increasing, and continued to increase through the mid 1990s. However, the average number of resident waterfowl hunters from 1996 through 2000 was only 56 percent of the number of resident waterfowl hunters in 1975 (Figure 6).

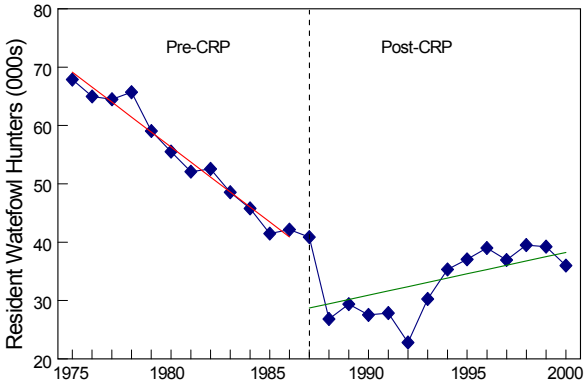

Figure 6. Resident Waterfowl Hunters, North Dakota, 1975 to 2000
Sources: Schroeder (1976-1979) and Johnson (1980-2001).

Since the loss of resident waterfowl hunters in the state from 1975 to 1992 is clearly outside of the influences of the CRP, and did not appear to be directly linked to wildlife populations, alternative procedures were developed to allocate changes in resident waterfowl hunter numbers resulting from the CRP.

Nonresident License Sales

Because nonresidents are required to have a small game license to hunt upland and/or waterfowl, small game license sales were used to identify trends in nonresident hunter numbers. The number of nonresident small game licenses remained relatively unchanged from 1975 through the early 1990s (Figure 7). However, nonresident small game license sales have increased substantially since the early 1990s. From 1990 to 2000, nonresident small game license sales increased 340 percent.

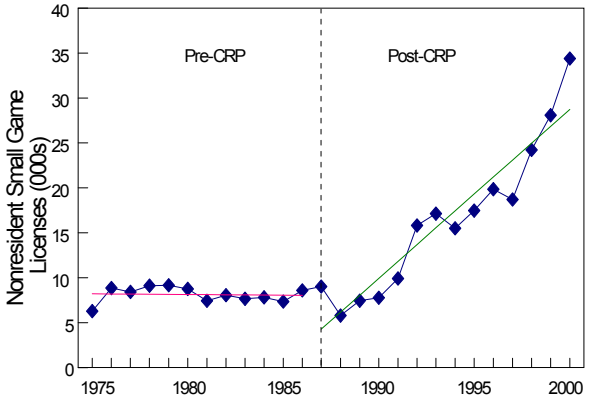

Figure 7. Nonresident Small Game Licenses, North Dakota, 1975 to 2000
Source: ND Game and Fish Department (2001).

In addition to a small game license, nonresident waterfowl hunters are required to purchase a nonresident waterfowl license. Nonresident waterfowl license sales remained largely unchanged from the mid 1970s to the mid 1980s (Figure 8). License sales dipped in the late 1980s, likely due to dry conditions in the state. However, the number of nonresident waterfowl hunters increased dramatically in the 1990s. From 1990 to 2000, nonresident waterfowl license sales increased 356 percent.

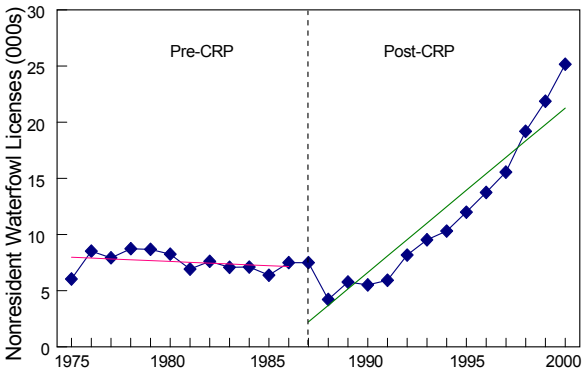

Figure 8. Nonresident Waterfowl Licenses, North Dakota, 1975 to 2000
Source: ND Game and Fish Department (2001).

The number of nonresident pheasant hunters has steadily increased in North Dakota since the mid 1970s (Figure 9). The percentage increase in nonresident pheasant hunters has been similar for both pre- and post-CRP periods--374 percent increase from 1975 to 1987 and 395 percent increase from 1987 to 2000. However, the increase in hunter numbers has been much greater in the post-CRP period (Figure 9).

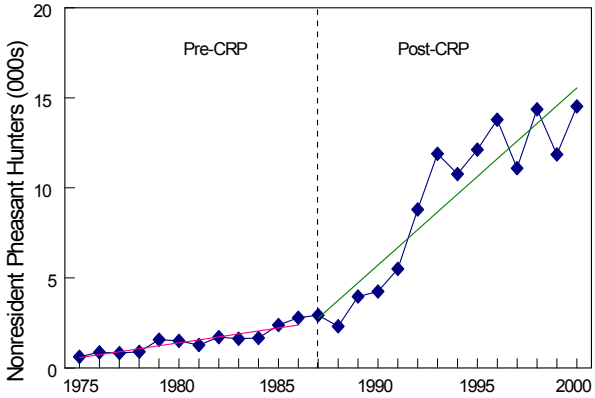

Figure 9. Nonresident Pheasant Hunters, North Dakota, 1975 to 2000
Source: Tripp (1976-2001).

Wildlife Population Indexes

Pheasant harvest data was used as a proxy for annual statewide pheasant population, since population indexes were incomplete from 1975 to 2000. While pheasant harvest is affected by the number of hunters, bag limits, length of season, pheasant populations, and hunting conditions throughout any particular season and may not necessarily represent actual statewide pheasant population, harvest data provided the best available estimate of pheasant populations.

Statewide pheasant harvest trended upward from the mid 1970s to the late 1980s. However, starting in 1990, annual pheasant harvest increased dramatically, culminating in a state record harvest in 1992. Statewide pheasant harvest dropped in 1993, but again reached near record levels in 1996. While the severe winter of 1996-1997 resulted in a substantial drop in pheasant harvest in 1997, pheasant harvest has continued sharply upward since 1997, however remained lower than the peak harvest years in the mid 1990s. While harvest data clearly show the CRP has had positive impacts on pheasant populations in the state, sufficient and abundant winter habitat remains an important factor in limiting pheasant populations in many areas of the state (ND Game and Fish Department 2002).

The trend in available firearm-deer tags in North Dakota has been increasing since the early 1980s. Statewide, deer tags increased 98 percent from 1980 to 1986, but then decreased nearly 30 percent in the following two years. The number of deer tags again increased in the early to mid 1990s, decreased slightly in 1998, but has since increased through 2001. The overall trend for deer harvest in the post-CRP period has been increasing, although at a lesser rate than in the pre-CRP period.

The ND Game and Fish Department and the US Fish and Wildlife Service both conduct annual statewide surveys of spring duck breeding populations. The techniques and methodologies used by the two agencies are similar, but not identical, and result in different estimates of the state's duck breeding population. Duck numbers in May appear to have fluctuated every few years from 1975 through the mid 1980s; however, the trend was slightly increasing. From 1986 to 1991, statewide duck breeding populations decreased. In the mid 1990s, duck populations increased rapidly, coinciding with an increase in water habitat as a result of the sustained wet weather cycle in the state. According to both estimates, duck populations increased dramatically in the post-CRP period.

Change in Hunter Numbers

Hunter numbers prior to the CRP were based on an average from 1982 to 1986 and post-CRP hunter numbers were based on an average from 1996 to 2000. Only pheasant, waterfowl, and deer hunting were included in the analysis because those hunting categories were identified as being the most influenced by the CRP. Pheasant, waterfowl, and deer hunting accounted for over 80 percent of all hunters in 1996 (Lewis et al. 1998).

Because the program cannot be credited with hunting levels prior to its existence, the number of hunters in the pre-CRP period was subtracted from the number of hunters in the post-CRP period. Similarly, not all of the change in hunter numbers can be attributed to the CRP. The relative role of the CRP in the change in hunter numbers was estimated for each of the three hunting categories based on wildlife and hunter trends, secondary sources, and input from wildlife biologists.

The change in resident and nonresident hunter numbers between the pre- and post-

CRP periods was estimated at about 78,400 individuals (i.e., individuals were counted separately for each activity) (Table 6). About 67 percent of the statewide increase came from resident hunters. The change in pheasant hunters, both resident and nonresident, was about 18,000 individuals or 23 percent of the total. Waterfowl hunters, both resident and nonresident, increased by 40,300 individuals and represented 51 percent of the increase in hunter numbers. Resident and nonresident deer hunters increased by 20,100 individuals or 26 percent of the change.

Table 6. Resident and Nonresident Pheasant, Waterfowl, and Deer Hunter Numbers, Before and After the Conservation Reserve Program, North Dakota

	Pre-CRP		Post-CRP		Change		
Hunting Type	Resident	Nonresident	Resident	Nonresident	Resident	Nonresident	Total
	---- Avg 1982-1986 -----		---- Avg 1996-2000 -----				
Pheasant	39,274	2,037	46,197	13,125	6,923	11,088	18,011
Waterfowl	see notes	5,077	38,142	18,974	26,425	13,897	40,322
Firearm-Deer	63,670	548	82,023	887	18,353	339	18,692
Archery-Deer	9,202	155	9,935	801	733	646	1,379
Totals	112,146	7,817	176,297	33,787	52,434	25,970	78,404

Notes: Resident waterfowl hunter numbers were estimated using a forecasting procedure comparing estimated hunter numbers in the post-CRP period without the program to actual hunter numbers.

The CRP was estimated to be responsible for 90 percent of the change in pheasant hunters in the state, because the primary reason for growth in pheasant populations was additional nesting habitat created by the CRP. Additional winter habitat, changes in agricultural practices, and reduced predatory pressures from mange in fox and coyote populations all played a minor role in the growth of pheasant populations (ND Game and Fish Department 2002).

The CRP was estimated to be responsible for 60 percent of the increase in waterfowl hunters, based primarily on research by Reynolds et al. (2001). Although waterfowl hunting in the state includes duck, dark geese (e.g., Canada geese), light geese (e.g., snow geese), swans, coots, and mergansers, the additional waterfowl hunters in the state were assumed to represent individuals who primarily hunt duck and dark geese. Although water habitat increased during the mid 1990s, additional water without sufficient and adequate nesting cover would not have produced the dramatic increase in duck and dark geese populations in the state (Reynolds et al. 2001, ND Game and Fish Department 2002).

Deer populations in the state were increasing prior to the CRP; however, the CRP was perceived to be largely responsible for maintaining the trend through the 1990s. White-tail deer, which inhabit most of the state, have responded well to the additional habitat provided by the CRP. Seventy percent of the increase in deer hunters was attributed to the CRP.

By the applying the above percentages to the change in hunter numbers over the period, the CRP added 54,400 hunters in the state (Table 7). Pheasant, waterfowl, and deer hunting represented 30, 44, and 26 percent of the increase, respectively.

Table 7. Estimated Number of Resident and Nonresident Pheasant, Waterfowl, and Deer Hunters Attributable to the Conservation Reserve Program, North Dakota

	Change in Statewide Hunters[a]			Percentage of the Change Attributable	Change in Hunters due to CRP		
Hunting Type	Resident	Nonresident	Total	to the CRP	Resident	Nonresident	Total
Pheasant	6,923	11,088	18,011	90	6,231	9,979	16,210
Waterfowl	26,425	13,897	40,322	60	15,855	8,338	24,193
Firearm-Deer	18,353	339	18,692	70	12,847	238	13,085
Archery-Deer	733	646	1,379	70	513	452	965
Totals	52,434	25,970	78,404		35,446	19,007	54,453

[a] Difference between pre-CRP hunter numbers (1982 to 1986 average) and post-CRP hunter numbers (1996 to 2000 average).

Hunter Numbers in Study Areas

Using data provided by the ND Game and Fish Department (2001) on resident and nonresident hunting destinations, the 16 study counties were determined to be the primary destination for about 37 percent of nonresident duck hunters and 43 percent of nonresident pheasant hunters. The study counties were the primary destination for 31 percent of resident duck hunters and 28 percent of resident pheasant hunters. Each study area was allocated a percentage of the increase in statewide deer hunters based on the share of state tags available in each study county.

Destination data was used to determine how many of the 54,400 additional hunters in the state hunted in each study area. The study areas were estimated to have about 18,400 additional hunters as a result of the CRP, of which 10,900 were residents and 7,500 were nonresidents (Table 8). The number of additional hunters in the study areas represented about 34 percent of the total statewide change in resident and nonresident hunters as a result of the CRP. Waterfowl hunting had the most hunters (about 8,000) attributable to the CRP in the study areas, followed by pheasant hunting with about 6,000 hunters, and deer hunting with about 4,700 hunters. The study counties contained 43 percent of all CRP land in the state and comprise 26 percent of the state's land area. Thus, the study areas received a disproportionate share of hunters based on land area, but received less than an equal share of hunters based on CRP acreage.

Table 8. Average Annual Number of Hunters Due Solely to the Conservation Reserve Program, by Study Area and Hunting Type, North Dakota, 1996 to 2000

Hunter Residence/ Hunting Type	Adams Bowman Hettinger	Burke Divide	Eddy Griggs Nelson	Kidder Logan Stutsman	McHenry Pierce Sheridan	Ransom Sargent	Total
Resident Hunters	1,191	994	2,220	2,933	1,747	1,813	10,898
Nonresident Hunters	1,882	1,463	436	1,871	1,406	488	7,546
Combined Residence							
Pheasant	2,536	1,411	30	976	493	567	6,013
Waterfowl	159	580	1,529	2,772	1,911	1,095	8,046
Firearm-deer	352	434	1,022	983	698	595	4,084
Archery-deer	26	32	75	73	51	44	301
Total	3,073	2,457	2,656	4,804	3,153	2,301	18,444

Resident hunters, in each study area, were divided by urban and rural residency. Urban resident hunters were defined as individuals living in communities with a population of 2,500 or greater and represented about 48, 53, 55, and 57 percent of all resident firearm-deer, archery-deer, pheasant, and waterfowl hunters, respectively (Lewis et al. 1998). Rural resident hunters were further subdivided into those living in the study area (i.e., local) and those living elsewhere in the state (i.e., nonlocal).

Hunter Expenditure Patterns

Lewis et al. (1998) surveyed both resident and nonresident hunters and anglers in North Dakota in 1996 to determine sportsman profiles (i.e., age, income, residence), expenditure patterns (e.g., type, amount, and location of expenses), and participation and harvest statistics. Seasonal expenditures for resident and nonresident hunters by hunting category and by location of spending were compiled (Table 9). Since some expenditures are made near the home, in route, and at the hunting destination, the amount of expenditures made in rural areas (i.e., towns less than 2,500 population) and urban areas were also estimated (Lewis et al. 1998). For resident hunters, seasonal expenditures in rural areas in 1996 ranged from $342 for urban resident firearm-deer hunters to $849 for rural resident archery-deer hunters. Seasonal expenditures for nonresident hunters in rural areas in 1996 ranged from $305 for firearm-deer to $718 for archery-deer hunters (Table 9). Seasonal hunter expenditures were adjusted to reflect 2000 dollars using the Consumer Price Index (U.S. Department of Labor 2002).

Table 9. Seasonal Expenditures in Rural and Urban Areas of North Dakota, by Resident and Nonresident Hunters, by Activity, 1996

Hunting Activity	Urban Resident Hunters		Rural Resident Hunters		Nonresident Hunters	
	Rural Areas[a]	Urban Areas[b]	Rural Areas[a]	Urban Areas[b]	Rural Areas[a]	Urban Areas[b]
	1996 $					
Deer						
Archery	520	623	849	566	718	239
Firearm	342	442	385	109	308	158
Small Game[c]					550	155
Waterfowl	637	792	729	218	na	na
Upland	637	928	729	230	na	na

[a] Estimated by ND Game and Fish Department using data from Lewis et al. (1998). Seasonal expenditures exclude purchases of licenses.
[b] Urban areas defined as cities with 2,500 population or greater.
[c] For resident hunters, small game hunting was split into waterfowl and upland. For nonresidents, waterfowl and upland hunting were not evaluated separately.
Source: Lewis et al. (1998).

All rural spending by rural nonlocal resident, urban resident, and nonresident hunters was considered new wealth to the study areas. However, only 42 percent of local rural resident hunter expenditures were assumed to represent "new money" in the study areas (Baltezore and Leitch 1992). All of the cities/towns in four of the six study areas matched the rural definition used by Lewis et al. (1998). However, two study areas each contain one trade center over 2,500 population and hunter expenditures in those cities would be classified as urban. In Kidder, Logan, and Stutsman Counties and McHenry, Pierce, and Sheridan Counties, 70 percent of urban expenditures by nonlocal rural resident, urban resident, and nonresident hunters and 90 percent of urban expenditures by local rural resident hunters was assumed to be captured locally.

RESULTS

The agricultural and recreational economic impacts of the program include estimates of the agricultural revenues that CRP lands would likely have generated if the program was discontinued, effects of reduced crop prices in the absence of the CRP, and estimates of hunter expenditures attributable to the CRP.

Agricultural Effects

Revenues that would have likely occurred on CRP lands from 1996 through 2000 were estimated based on post-CRP land use intentions of contract holders, adjusted crop yields, anticipated crop prices, and estimated government farm program payments. Typical gross revenues for CRP land returning to crop production ranged from about $79 per acre in Burke and Divide Counties to $170 per acre in Ransom and Sargent Counties (Table 10). Typical revenues for hay production from CRP lands ranged from $47 per acre in Adams, Bowman, and Hettinger Counties to $76 per acre in Ransom and Sargent Counties. Typical revenues from grazing CRP lands ranged from $25 per acre in Burke and Divide Counties to $49 per acre in Ransom and Sargent Counties (Table 9). Land left in permanent cover was assumed to generate revenues equal to the estimated government payment (see Table 5). Average agricultural revenues per acre, based on post-CRP land use ratios for crop, hay, grazing, and permanent cover, ranged from $65 in Burke and Divide Counties to $149 in Ransom and Sargent Counties (Table 10). The average for all study areas was estimated at $91 per acre.

Regional agricultural revenues were estimated by multiplying per acre revenues by the estimated post-CRP acreage for crop, hay, grazing, and permanent cover use in each study area. Gross agricultural revenues from post-CRP lands varied from $8.7 million per year in Burke and Divide Counties to $33.1 million per year for Kidder, Logan, and Stutsman Counties (Table 10). Total gross agricultural revenues from post-CRP land use in the six study areas was estimated at $123.6 million annually (Table 10). Crop production accounted for 85 percent of all agricultural revenues.

Table 10. Gross Agricultural Revenues for Post-Conservation Reserve Program Lands, North Dakota, 1996 through 2000

Post-CRP Agricultural Revenues	Adams Bowman Hettinger	Burke Divide	Eddy Griggs Nelson	Kidder Logan Stutsman	McHenry Pierce Sheridan	Ransom Sargent
	$ per acre					
Crop Production	86.12	79.37	128.36	108.30	96.07	170.10
Hay Production	47.37	50.52	66.47	69.30	58.87	75.60
Grazing	30.66	25.39	36.11	39.68	30.44	48.88
Permanent Cover	11.41	11.29	17.44	13.73	13.11	16.76
Average	69.53	64.63	110.11	93.76	79.08	149.22
	000s $					
Crop Production	14,843	6,710	24,134	27,313	16,744	15,529
Hay Production	2,133	1,556	1,870	4,423	2,261	584
Grazing	823	431	845	1,309	1,195	514
Permanent Cover	160	31	89	55	55	36
Totals	17,959	8,728	26,938	33,100	20,254	16,663

While total gross agricultural revenues that would have been generated without the CRP were estimated at $123.6 million, the direct economic effect on rural economies of terminating the CRP is not equal to the gross agricultural revenues. The current CRP payment on enrolled land must be subtracted from gross agricultural revenues. The difference between gross agricultural revenues and contract payments would represent the net agricultural effects on post-CRP lands. The net change in agricultural revenues on CRP lands in the six study areas was estimated at $76 million or about $56 per acre (Table 11).

Table 11. Net Change in Agricultural Revenues on Post-Conservation Reserve Program Lands, North Dakota, 1996 through 2000

Study Counties	Average 1996 through 2000 Agricultural Revenues	Average 1996 through 2000 Contract Payments	Net Change Per Acre	Net Change Total
	$/acre		- $ -	000s $
Adams, Bowman, and Hettinger	69.53	31.46	38.07	9,833
Burke and Divide	64.63	33.61	31.02	4,189
Eddy, Griggs, and Nelson	110.11	34.43	75.68	18,514
Kidder, Logan, and Stutsman	93.76	34.77	58.99	20,825
McHenry, Pierce, and Sheridan	79.08	34.73	44.35	11,359
Ransom and Sargent	149.22	47.88	101.34	11,317
Average/Total	90.99	35.03	55.96	76,038

In the absence of some other form of supply control in Federal farm legislation, and assuming no other changes occurred in commodity supply and disappearance, returning CRP lands to agricultural production during the 1996 to 2000 period would have lowered commodity prices. Lower prices would have reduced agricultural revenues on non-CRP lands in the six study areas by $25.9 million (Table 12). The annual economy-wide agricultural impacts (i.e, change in agricultural revenues on CRP and non-CRP lands) of terminating the CRP ranged from $1.6 million in Burke and Divide Counties to $15.7 million in Kidder, Logan, and Stutsman Counties (Table 12). The overall effect, increased revenue from CRP lands returning to agricultural production and decreased revenues on non-CRP lands in the study areas, was estimated at $50.2 million.

Table 12. Annual Economy-wide Direct Economic Effects from Changes in Agricultural Revenues with Termination of the Conservation Reserve Program, Study Areas, 1996 through 2000

Post-CRP Changes	Adams Bowman Hettinger	Burke Divide	Eddy Griggs Nelson	Kidder Logan Stutsman	McHenry Pierce Sheridan	Ransom Sargent	Total
	000s $						
Change on CRP Lands Returning to Production	9,833	4,189	18,514	20,825	11,359	11,317	76,038
Crop Revenues on Non-CRP Lands	(3,229)	(2,580)	(4,598)	(5,128)	(5,019)	(5,304)	(25,858)
Net Change	6,604	1,609	13,916	15,697	6,341	6,013	50,180

Recreational Effects

Hunting impacts attributable to the CRP were estimated by multiplying the number of local rural, nonlocal rural, and urban resident and nonresident pheasant, waterfowl, and deer hunters by the appropriate seasonal hunting expenditures. CRP-related hunter expenditures in the six study areas were estimated at $12.8 million annually (Table 13). Expenditures from resident hunters accounted for 61 percent of the total or about $7.9 million, with urban resident hunters accounting for 60 percent of all resident hunter expenditures (Table 13). Nonresident hunter expenditures were estimated at $5 million or 39 percent of all hunting expenditures. Just over half of the total hunting expenditures attributable to the CRP was from waterfowl hunters. Pheasant hunting accounted for 32 percent of CRP-related expenditures and firearm- and archery-deer hunting accounted for about 16 percent of all hunter expenditures (Table 13).

Table 13. Average Annual Hunter Expenditures Attributable to the Conservation Reserve Program, All Study Areas, North Dakota, 1996 to 2000

Residence of Hunter	Type of Hunting Activity: Pheasant	Waterfowl	Firearm-Deer	Archery-Deer	Total
	000s of 2000 $				
Resident					
Rural[a]	565.4	1,687.6	819.8	71.2	3,144.0
Urban[b]	800.9	2,894.1	982.7	64.7	4,742.4
Total	1,366.3	4,581.7	1,802.6	135.9	7,886.4
Nonresident	2,717.1	2,086.6	29.1	121.7	4,954.5
Total	4,083.4	6,668.3	1,831.6	257.6	12,840.9
	%				
Share of all expenditures					
Resident	10.6	35.7	14.0	1.1	61.4
Nonresident	21.2	16.2	0.2	0.9	38.6

[a] Rural resident hunters defined as those living in rural areas or in communities with a population less than 2,500.
[b] Urban resident hunters defined as those living in communities with a population of 2,500 or greater.

Total CRP-related hunter expenditures varied from $4.1 million annually in Kidder, Logan, and Stutsman Counties to $1.3 million annually in Ransom and Sargent Counties (Table 14). Annual expenditures from resident hunters ranged from $0.5 million in Burke and Divide Counties to $2.8 million in Kidder, Logan, and Stutsman Counties. Annual nonresident expenditures ranged from $0.3 million in Eddy, Griggs, and Nelson Counties to $1.4 million in Kidder, Logan, and Stutsman Counties (Table 14). Expenditures from pheasant hunting were highest in Adams, Bowman, and Hettinger Counties. Kidder, Logan, and Stutsman Counties captured the greatest amount of waterfowl and deer hunting expenditures.

Table 14. Average Annual Hunter Expenditures Attributable to the Conservation Reserve Program, by Study Area, North Dakota, 1996 to 2000

Hunter Residence/ Hunting Type	Adams Bowman Hettinger	Burke Divide	Eddy Griggs Nelson	Kidder Logan Stutsman	McHenry Pierce Sheridan	Ransom Sargent	Total
	000s of 2000 $						
Resident Hunters	726	536	1,214	2,791	1,586	1,033	7,886
Nonresident Hunters	1,136	884	265	1,356	1,019	296	4,955
Combined Residence							
Pheasant	1,619	885	17	808	389	364	4,083
Waterfowl	92	355	1,038	2,691	1,766	726	6,668
Firearm-deer	132	157	369	570	397	208	1,832
Archery-deer	19	23	54	78	53	30	258
Total	1,863	1,420	1,479	4,147	2,605	1,328	12,841

Combined Effects

Annual net forgone agricultural revenues in the six study areas were estimated at $50.2 million. Annual recreational revenues from hunting activities attributable to the CRP in the six study areas was estimated at $12.8 million. Recreational impacts from the program in the study areas varied from $6 to nearly $12 per CRP-acre (Table 15). Average recreational revenues for the six study areas was $9.45 per CRP-acre. Recreational revenues were estimated to offset 26 percent of the agricultural losses associated with the program. Overall, net economic losses in the study areas were estimated at $27 per CRP-acre (Table 15).

The net effect of agricultural losses (foregone revenues) and recreational gains (hunting expenditures attributable to the CRP) differed greatly among the study areas (Table 15). In Burke and Divide Counties, recreational expenditures were estimated to offset 88 percent of the lost agricultural revenues. In three other areas (Adams, Bowman, and Hettinger Counties; Kidder, Logan, and Stutsman Counties; McHenry, Pierce, and Sheridan Counties) recreational expenditures offset a reasonable amount (26 percent to 41 percent) of lost agricultural revenues. In Ransom and Sargent Counties, 22 percent of lost agricultural revenues were offset with hunting expenditures; however, net losses were nearly $42 per CRP-acre. Similarly, recreational revenues in Eddy, Griggs, and Nelson Counties were estimated to offset only 10 percent of the lost agricultural revenues and net losses were nearly $50 per CRP-acre.

Table 15. Changes in Average Annual Agricultural and Recreational Revenues, Due to the Conservation Reserve Program, by Study Area, North Dakota, 1996 to 2000

Revenue Category		Adams Bowman Hettinger	Burke Divide	Eddy Griggs Nelson	Kidder Logan Stutsman	McHenry Pierce Sheridan	Ransom Sargent	Total
		2000 $						
Agriculture								
Total[a]	(000s $)	(6,604)	(1,609)	(13,916)	(15,697)	(6,341)	(6,013)	(49,852)
Per CRP acre		(25.57)	(11.92)	(56.89)	(44.46)	(24.76)	(53.85)	(36.93)
Recreation								
Total	(000s $)	1,863	1,420	1,479	4,147	2,605	1,328	12,841
Per CRP acre		7.21	10.51	6.04	11.75	10.17	11.89	9.45
Offset of ag losses		28.2%	88.2%	10.6%	26.4%	41.1%	22.1%	25.6%
Gains/(Loses)								
Total	(000s $)	(4,742)	(189)	(12,438)	(11,550)	(3,736)	(4,685)	(37,339)
Per CRP acre		(18.36)	(1.40)	(50.84)	(32.72)	(14.59)	(41.95)	(27.48)

[a] The total net effect is a combination of revenues (gains) from putting CRP acres back into agricultural production and a reduction in rural agricultural revenues (losses) from reduced prices on non-CRP lands (based on termination of the CRP). The agricultural revenues on CRP lands were based on contract holders' intended post-CRP land use, adjusted yields, and a slight decrease in 1996-2000 average producer prices. Numbers are expressed as negatives to represent lost revenues.

DISCUSSION

Although this study examined the recreational gains and agricultural losses in rural economic activity due to the CRP, the analysis should be viewed cautiously, as a number of assumptions were necessary to bridge data gaps. Study results were sensitive to those assumptions.

Key Factors

Returning CRP lands to agricultural use would have both regional and national effects on crop prices and would affect revenues on both CRP-lands returning to agricultural use and revenues on non-CRP lands. Because so many acres of production would be impacted, even small changes in crop prices have substantial effects on agricultural revenues. Therefore, study results were sensitive to the price effects estimated in the absence of the CRP.

The most critical component in the recreational analysis was the role the CRP has on hunting activity. Small changes in the relative effect of the CRP on hunter numbers produced disproportionately greater changes in the level of recreational revenues. As a result, the recreational component of the study was especially sensitive to the level of hunting activity attributed to the program.

Data Shortcomings

The degree to which the CRP has affected wildlife populations is difficult to quantify. Numerous other factors, in addition to the CRP, have simultaneously played a role in maintaining and/or increasing wildlife populations since the CRP was initiated. Unfortunately, quantitative data to specify the role of each contributing factor was unavailable. As a result, to estimate the effect the CRP has on wildlife populations, non-quantitative data

was used and represented the best information available.

The specific link between wildlife populations and hunter participation levels is also difficult to quantify. Lifestyle factors (e.g., amount of leisure time, disposable income) and regulatory influences (e.g., limits on licenses, land posting and access issues, limits on hunting days allowed) all affect hunter participation. Because of the number and complexity of lifestyle, regulatory, and wildlife-population factors, their effect on hunter participation levels was not examined.

The substitution relationship between hunting and other recreational activities is unknown. The CRP has clearly created additional hunting opportunities in the state; however, in the absence of those opportunities, what hunters would do with income currently spent on hunting has direct implications on the amount of recreational revenues that can be attributed to the program. The primary factors that motivate individuals to choose hunting activities over other recreational activities are unknown and were not addressed.

Geographic hunting patterns of both rural and urban resident hunters by region or county in the state are important in estimating local economic impacts from hunting-based recreation. It is unknown to what degree rural resident hunters pursue game near their residence or travel to other areas of the state to pursue game. It is also unknown if the hunting destinations of urban hunters differ from rural hunters. Because no data was available to distinguish the difference between rural and urban hunter destinations, destination data was applied equally to both rural and urban resident hunters and assumptions were used to estimate the number of rural hunters that represented local and nonlocal hunters in each study area.

The recreational impacts of the CRP are likely understated in this study, as only impacts associated with pheasant, waterfowl, and deer hunting were included. Including the change in participation levels from all types of hunting affected by the CRP would increase the level of hunting expenditures associated with the program. Wildlife viewing is also an important form of wildlife-based recreation that generates substantial economic impacts in North Dakota. However, due to a lack of data, the change in wildlife-viewing activities attributable to the CRP were not included in the study. Any increase in nonwildlife-based recreation activities (e.g., horseback riding) due to the CRP would also potentially add to the recreational impacts of the program. Including all wildlife- and nonwildlife-based recreational activities affected by the CRP would provide a more comprehensive picture of the recreational effects of the program.

The assessment of the net economic impacts of the program were based on averages from 1996 through 2000. While per-acre agricultural revenues over that period changed little, the number of individuals hunting increased dramatically. Hunter numbers have continued to increase in 2001 and preliminary data suggest hunter numbers in 2002 will be similar to 2001 levels. If 2001 and 2002 data were used instead of averages from 1996 to 2000, recreational effects of the CRP would be considerably higher than estimated in this report. If hunting levels continue to increase and foregone agricultural revenues remain similar, the ability of rural economies to offset agricultural losses stemming from the CRP will also increase.

Estimating new wealth created by recreational activities attributable to the CRP presented several challenges. Because the study relied, to some degree, on assumptions and qualitative data in the absence of adequate quantitative data, the value of the study lies not with the

preciseness of the estimates. Rather, the study provides a reasonable first attempt to quantify the relative magnitude of the two most salient economic impacts of the program: lost agricultural revenues and new recreational revenues. Despite numerous data limitations, this study provides a legitimate insight into the net economic effects of the CRP in rural North Dakota.

CONCLUSIONS

Long-term crop retirement programs generally produce, in varying degrees, negative effects on those businesses and economic sectors that provide agricultural inputs. The Conservation Reserve Program, however, has influenced wildlife-based recreation, primarily hunting, and to a lesser extent, wildlife viewing, which has produced positive economic impacts for other businesses and economic sectors.

Few studies have attempted to include recreational revenues in the economic assessment of the program. The analysis of the economic gains and losses due to the CRP should be viewed cautiously, as study results were sensitive to several assumptions made in the absence of appropriate data. Further, this analysis may not accurately or precisely predict future economic effects of the program if changes occur in hunter participation levels, Federal farm program legislation, and/or CRP payment rates. Including more current hunter participation levels and incorporating expenditures from all recreational activities associated with the CRP would improve the recreational impacts, and as such, could result in the economic burden of the program being less than estimated in this report.

The future ability of rural areas to offset CRP-based agricultural losses with wildlife-related recreational expenditures will largely be dependent upon pheasant and waterfowl hunting. Pheasant and waterfowl hunting accounted for over 80 percent of all CRP-based hunting expenditures, and current data indicates that even major increases in deer hunting expenditures will likely only offset small reductions in pheasant and waterfowl hunting expenditures. Consequently, not all areas of North Dakota will be able to equally offset agricultural losses with recreational revenues. Future wildlife population levels, policies, and hunting trends which affect pheasant and waterfowl hunting will have the greatest affect on the level of recreational revenues captured in rural areas.

Collectively, resident hunter expenditures were a substantially higher source of new wealth than nonresident hunters. However, both resident and nonresident hunter expenditures are important sources of recreational revenues in most areas of the state. The future ability of rural areas to offset CRP-based agricultural losses will be dependent upon expenditures from both resident and nonresident hunters and factors which substantially affect either group will have implications on the amount of recreational spending captured in those rural economies.

The degree to which CRP-based hunting revenues in rural areas offset agricultural losses varied throughout the state. In several cases, hunting expenditures offset a substantial portion of the agricultural losses, while in other areas, the net economic loss from the program remains high. The net economic effects of the program in the western and central areas of the state were the most favorable, whereas the net effect of recreational and agricultural revenues in eastern areas of the state were not nearly as favorable. In North Dakota, the net economic effects of the CRP indicate that several areas of the state are not as economically burdened by the program as previous research has suggested.

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This document is a summary of a more comprehensive report which contains supplemental information and additional documentation of study results. Copies of this report and a single copy of the main report, *Rural Economic Effects of the Conservation Reserve Program in North Dakota*, are available free of charge. Please address your inquiry to Carol Jensen, Department of Agribusiness and Applied Economics, North Dakota State University, P.O. Box 5636, Fargo, ND 58105-5636, phone 701-231-7441, fax 701-231-7400, e-mail cjensen@ndsuext.nodak.edu or these publications are available on the world wide web at http://agecon.lib.umn.edu/ .

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