Appendix D
LITERATURE REVIEW AND RESEARCH RECOMMENDATIONS FOR THE CONSERVATION RESERVE PROGRAM

SECTION 1
INTRODUCTION

This paper documents a preliminary review of available scientific studies on the efficacy and benefits of the Conservation Reserve Program. Section 2 describes research done on the environmental benefits of CRP in the areas of soil quality, wildlife, water quality, and carbon sequestration. Section 3 reviews studies on the socioeconomic effects of CRP, addressing cost-benefit analyses, benefit-cost measurement, efficiency and cost-effectiveness, re-enrollment, economic impacts, social impacts, and slippage. The last section summarizes the results of an informal survey of researchers and literature, and presents some general conclusions about the direction of future research.

1.1 OVERVIEW OF CRP GOALS

The purpose of CRP is to cost-effectively assist owners and operators in conserving and improving soil, water, and wildlife resources by converting highly erodible and other environmentally sensitive acreage normally devoted to the production of agricultural commodities to a long-term resource-conserving cover. CRP participants enroll contracts for periods from 10- to 15-years in exchange for annual rental payments and cost-share assistance for installing certain conservation practices.

Agricultural conservation programs have historically focused on soil integrity, but as technology, society, and commodity demand changes, so does conservation policy. This is demonstrated by the overall change in CRP from its origin in the 1985 Farm Bill to what is being considered in the pending version of the 2002 Farm Bill. Structural changes in program regulations in the 1990 Food, Agriculture, Conservation and Trade Act (FACTA), and in the 1996 Conservation Title of the Federal Agricultural Improvement and Reform Act (FAIR) recognized additional benefits, namely improvements in water quality, air quality, and wildlife habitat. Prior to 1990, highly erodible land was the primary target for CRP enrollment. The current targeting methods try to incorporate a wider range of environmental benefits.

A variety of conservation practices have been employed to benefit soil quality, water quality, and wildlife enhancement. The benefits provided by these practices include:

1) Establishment of long-term vegetative cover on cropland reduces soil erosion and the quantity of soil and other agricultural pollutants that may enter water bodies and impair water uses.
2) Enrollment of environmentally sensitive areas, such as those that are flood-prone or in riparian areas, benefits wildlife and water quality by providing cover for protection, moderation of the temperatures of streams and other water bodies, food sources for wildlife, and protection of water bodies from sediment, pesticide, and nutrient pollution.
3) Environmental benefits associated with wildlife enhancements are increased by enrollment of wetlands and associated uplands, and enrollment of habitat important to threatened and endangered species.

Retiring equal amounts of cropland in two different areas of the country will produce different environmental benefits. This difference, which can be significant, depends on factors such as characteristics of surrounding populations, and the environmental quality of the retired lands (USDA, 1999).

Initial program objectives also included an economic component designed to provide income stability for farmers and a savings in government price support payments and storage costs. The 1996 FAIR Act added that the CRP should "cost-effectively reduce water and wind erosion, protect the Nation's long-term capability to produce food and fiber, reduce sedimentation, improve water quality, create and enhance wildlife habitat, and other objectives including encouraging more permanent conservation practices and tree planting" (CFR, Section 1410.3).

1.2 SCOPE AND SCALE OF CRP STUDIES

The impacts of CRP occur both on the on and off farm. On-farm impacts can include improvements in soil productivity, income stability, and increased production on remaining cropland. There are two general categories of off-farm impacts: those affecting residents of the local community, and those affecting non-residents. Community level impacts are largely affected by demand, expenditure, and demographic changes. Non-resident off-farm impacts are affected through improvements in water quality, wildlife habitat, and air quality, which increase recreational opportunities, decrease treatment costs and improve the sustainability and consumption of water and wildlife resources. Contributing factors to farm and local community impacts are participation incentives, financial opportunity, and a conservation ethic. Factors contributing to off-farm impacts include national enrollment ranking criteria and political considerations. It has generally been found that off-farm benefits exceed on-farm benefits (USDA-ERS, 2000b; Poe, 1999; Young and Osborn, 1990; USDA-ERS, 1990b).

The scope of CRP is multifaceted, integrating national, regional, state, county, and local agencies utilizing CRP-General, CRP-Continuous, and CREP to accomplish the program's goals. Traditionally, CRP enrollment data has been compiled at the county level, this scale influenced the scale of some of the environmental analysis and almost all of the economic analysis. County information is often aggregated to the state level, several states to the regional level, and the regions to the national level.

The effect of CRP on socioeconomic and environmental resources can be analyzed using different scales, however. The scale of the impact analysis and the geographical frequency within which the impacts are felt varies. For example, the absolute number of tons of soil lost through erosion may be highest in the Mountain and Corn Belt States, while the dollar amount of damages per acre is highest in the Northeastern States, where population demand for in-stream uses of surface water is highest (Poe, 1999).

The varying scales and scopes in which the program functions have made it difficult for the scientific community to produce comprehensive analysis. It has also increased the need for effective policy targeting that can create a comprehensive conservation protection plan (USGAO, 2002; Ribaudo et al., 2001; Committee on Agriculture, 1999; Karlen, Gardner, and Rosek, 1998;

Angermeier and Karr, 1994; Mitchell and Evans, 1987; White, 1987). A political boundary-restricted scale does not always reflect the spatial extent of the impacts produced by CRP. For instance, economic effects may be felt on a sub-county or township level, but are 'averaged' out when aggregated to the county level. Environmental effects are usually best analyzed on an ecosystem, watershed, or critical habitat basis.

The literature review that follows introduces some of the impacts of the CRP, both predicted and actual, based on observation. Until recently, most of the socioeconomic analysis took place within the confines of a political boundary and a majority of the early environmental analysis took place at the local level, but this approach has recently shifted to a more integrated regional examination of economic and environmental effects. Development of CREP after 1996 moved a portion of the CRP from a national program, that incorporated regional and local goals in a general way, to one that included regional goals at the watershed or ecosystem level. Over the past seven years, comprehensive models incorporating the interaction between the environment and the economy have been used to assess the effects of the CRP. Thus, the political boundary scale of analysis to address resource changes has been shifting to a spatial scale that produces a more comprehensive impact analysis.

Excellent literature reviews have been prepared prior to this endeavor. Hughes et al. (1995) surveyed much of the policy literature relating to CRP, combining their findings with policy preferences indicated by agricultural interest groups. The USGS Northern Prairie Science Center maintains an on-line bibliography of documents pertaining to the effects of the CRP on wildlife (Allen, 1996). The literature reviewed below identifies issues and impacts that have been common since the program's inception, but primarily concentrates on issues that have been raised since 1995. There was a flurry of articles written in preparation for development of the 1996 Farm Bill, much of it using data from the first 5-6 years of the program. Research done after this period is emphasized because of its perceived relevance to the analysis to be done for the Programmatic Environmental Impact Statement on the CRP.

SECTION 2
CONSERVATION OBJECTIVES OF CRP

2.1 SOIL QUALITY

Excess soil erosion may eventually reduce crop yields by lowering water holding capacity, decreasing nutrient availability, lowering water infiltration rates, and decreasing organic matter levels of topsoil. Permanent vegetative cover, like that established under CRP, diminishes the amount of topsoil and other agricultural pollutants that surge into water bodies and impair water uses. Some direct impacts of excessive soil erosion and ensuing sedimentation include: impaired aquatic habitat, loss of sport/commercial fisheries, decreased soil productivity, aggradation of drainage and irrigation channels, excessive flooding, lost soil productivity due to deposition and overwash, lost reservoir flood control and power generation capabilities, impaired navigation, reduced recreational opportunities, augmented water treatment requirements, and impaired aesthetic values. There are also indirect impacts associated with sediment loading such as decreased dissolved oxygen levels and increased in stream temperature levels.

Long-term CRP vegetative growth, height, density, and percent cover relative to disturbances, mowing, and haying are essential to understanding soil quality responses to CRP (Allen, Cade, and Vandever, 2001; Baer, Rice, and Blair, 2000; Christian and Wilson, 1999; Jewett et al., 1996a, 1996b; Schumacher et al, 1995a, 1995b, 1995c).

Soil quality and productivity can be determined through the correlation of physical, chemical, and biological properties, such as water-holding capacity, nutrient availability, water infiltration rate, soil depth, microbial biomass, carbon and nitrogen content, and crop yield. However, several non-controllable factors can also influence soil quality and productivity, such as precipitation patterns, climate, and hydrogeology. Soil quality and productivity are essentially controlled by land use patterns, but the degree of soil quality improvement is dependent upon soil type and location. The interpretation of soil quality indicator data using a structured approach can allow the linking of various scales of evaluation, like those needed for assessing CRP, to be more efficient in targeting the most environmentally sensitive land (Karlen, Gardner, and Rosek, 1998; Wu et al., 1997).

Wienhold and Tanaka (2000) studied the effects of haying (hayed or not hayed prior to tillage), tillage (no-tillage, minimum tillage, or conventional tillage), and nitrogen fertilization on surface infiltration rates on a CRP study site. Plots hayed prior to tillage exhibited higher infiltration rates when no fertilizer was applied than when plots were hayed and fertilized or not hayed at all. As tillage intensity increased, surface infiltration increased. These results are similar to a study conducted in the Southeast where the use of surface tillage in land management systems was determined to be the controlling factor that dictate soil quality and soil carbon sequestration (Torbert, Prior, and Reeves, 1999).

Enrollment into CRP can have a positive effect on several soil quality indicators, especially if the management practices being used for crop production involved intensive tillage operations or the

use of fallow periods before enrollment. Therefore, to help sustain soil quality benefits obtained by enrolling highly erodible land into the CRP, no-till or reduced tillage practices should be considered if the land is returned to row-crop production (Karlen et al., 1999; Karlen, Gardner, and Rosek, 1998; Schumacher et al., 1995c).

2.2 WILDLIFE

There are numerous stressors that can have a major impact on wildlife habitat and population structure, including: conversion or alteration of prairie, wetland, and riparian zones to cropland, increased sedimentation in streams, and disproportionate fertilizer and chemical application. Wildlife can be one of the best indicators of ecosystem health and can serve as a good measure of CRP success if clear and concise wildlife objectives are defined before the program is implemented on any land.

Currently, no clear way to estimate the actual benefits to wildlife from CRP enrollment have been explicitly defined. However, since the 1996 Farm Bill, most experts believe the continuation of CRP will result in increased wildlife habitat and possibly increase the abundance of game, non-game, and threatened and endangered species throughout the United States (GAO, 2002; Brady, 2000; Heard et al., 2000).

The impact of the CRP on bird populations in the central United States, where CRP replaced production agriculture fields with grassland habitat used by more than 90 species of birds, was reviewed by Ryan, Burger, and Kurzejeski (1998). At least 42 bird species nested in CRP habitats with avian species richness in CRP fields similar to that of row crop fields. However, relative abundance was 1.4 to 10.5 times higher, and nest abundance was 13.5 times higher in CRP than crop fields. Nesting success of songbirds was only slightly higher in CRP fields (40% vs. 36% in crops). Limited evidence suggested that CRP has positively affected the population growth rates of several nongame grassland bird species. Waterfowl nest densities and nesting success in CRP fields were similar to those occurring in grassland habitats managed specifically for waterfowl. Overall, grassland birds known to be declining throughout North America appeared to benefit the most from the CRP. Similar studies have attempted to evaluate avian species composition, nest success, nest density, and population density associated with CRP throughout the United States, but with varying results (Koford, 1999; Rodgers, 1999; Swanson, Scott, and Risley, 1999; Herkert, 1998; Best et al., 1997; Carmichael, 1997; Dale, Martin, and Taylor, 1997; Granfors, Church, and Smith, 1996; McCoy, 1996; Berthelsen and Smith, 1995; Johnson and Igl, 1995, 2001; King, 1995; Klute, 1994; Kantrud, 1993; Patterson, 1993; Stauffer, Cline, and Tonkovich, 1990; Berthelsen, 1989; Boettcher, 1989; Frawley, 1989).

Wildlife benefits are very hard to quantify, but if well-defined goals/objectives are established, this assessment becomes easier. Specific goals pertaining to the wildlife benefits of CRP should be defined at the local, regional, and national level (Allen, 1993), with each land-use conservation practice producing a defined wildlife management goal under CRP. The need to explicitly define CRP wildlife objectives is demonstrated in the Midwest. Although the conversion from cropland to grassland habitat through CRP has led to improvement in nest

densities, some native prairies critical to many species' survival continue to decline in acreage and quality (Wildlife Management Institute, 2001).

Wetlands are an integral part of any ecosystem because of their capacity to filter water borne sediments, chemicals, and nutrients. Any lost filtering capacity can cause pollutants to enter the watershed and adversely affect aquatic vegetation, fish, invertebrates, and other water dependent wildlife. Prairie wetlands provide critical habitat valued by migratory birds, aquatic wildlife, and furbearers, with surrounding CRP grasslands providing the necessary habitat needed for upland nesting birds (Weitman, 1994). However, habitat fragmentation from intensified farming has concentrated nesting waterfowl and their predators in the remaining, relatively small untitled habitats of the prairie pothole region in the United States (Kantrud, 1993). During 1989-1991, waterfowl nest success on CRP fields in areas of high wetland density in the prairie pothole region was 23.1 percent compared to 8.3 percent for similar covers on federal waterfowl production areas. CRP fields thus provided more secure nesting cover for upland-nesting ducks than waterfowl production areas. CRP fields are abundant and have a wide variety of age classes and sizes. These characteristics made CRP fields well suited as study sites for determining the effects of cover area, distance to water, and coverage type on nest success of ducks. It was proposed that the presence of CRP land might influence decisions about intensive management of public lands devoted to waterfowl production.

Conversion of grasslands and wetlands to cropping uses has contributed to a significant decline in habitat for many grassland and wetland bird and animal species, particularly in portions of the Corn Belt and Northern and Southern Plains. CRP can be useful in reducing threats to species population declines, and in maintaining stable populations of wildlife (Wildlife Management Institute, 2001).

2.3 WATER QUALITY

CRP is the primary federal program to control nonpoint-source pollution in agricultural watersheds of the U.S. The program is designed primarily to reduce soil erosion rather than to retire croplands in a manner optimal for controlling runoff of sediment and associated pollutants. Lant (1991) estimated potential enrollment of streamside and floodplain croplands in CRP in order to gauge the potential of the program as a water quality improvement policy. A contingent choice survey design was employed in Fayette County, Illinois, to demonstrate that there is substantial potential for retirement of streamside and floodplain croplands in the CRP. Enrollments in each program climb from less than 6% to over 83% of eligible cropland as the annual rental rate is increased from $20 to $200 an acre. Potential retirement of streamside and floodplain croplands declines, however, if tree planting, drainage removal, or a 20 year contract is required. The potential of a CRP-based water-quality program to improve water quality and aquatic ecosystems in agricultural watersheds is substantial. However, the farmers, in determining the use of their riparian lands, are constrained by the economic tradeoffs that they make between crop production and conservation incentives.

A majority of the Nation's irrigated land is located west of the Mississippi River and in the southwestern part of the country. A primary objective of CRP is to preserve and enhance water quality through various conservation practices. Although CRP was not established as a water

conservation program, CREP programs can involve water conservation, like those proposed in the Pacific Northwest. These types of programs are still in the early stages of implementation and development, and their effectiveness has yet to be determined (USDA, 2001). Water availability and distribution in arid portions of the West have complicated riparian habitat conservation and restoration efforts, causing a need for water conservation programs. An example of this would be riparian vegetation in Arizona, where instream flows have been reduced and some rivers de-watered to the point that riparian areas are becoming scarce (Wildlife Management Institute, 2001).

Water quality integrity is essential to local aquatic and terrestrial ecosystems, especially if threatened and endangered species are present. In South Dakota, it is estimated that CRP, along with proper grazing management, created excellent water conditions to help fledge an additional 900,000 ducklings per year (USDA, 1999). CRP-Continuous signup has also made important contributions to local water quality condition contributions by enrolling small acreages of land into high benefit environmental practices, which primarily target water quality improvements (USDA, 2001). CRP has demonstrated its ability to improve water quality (Huang et al., 1990), but has not yet established its capacity as a water conservation program. The scope and timeframe for CRP contracts does not allow for water conservation, but does figure into the issue of protection of aquatic threatened and endangered species habitat through the modification of water flows (Szentandrasi et al., 1995). Large scale watersheds should be the primary focus for water conservation programs instead of individual local water bodies. CRP may be the link between water conservation and protecting water quality.

2.4 CARBON SEQUESTRATION

Integrating measures for improving the full life cycle of carbon uptake in terrestrial ecosystems, including both farmland and forests, offers significant opportunity for carbon sequestration (see Figure 1). CRP provides two types of ecosystem for carbon sequestration. The first, is forest lands created through the planting of trees. This ecosystem focuses on below-ground carbon and long-term management and utilization of standing stocks, ground cover, understory, and litter. The second, is agricultural lands (i.e. grasslands, crop lands, and range lands). Both CRP managed land systems provide a means for the sequestering of long-lived carbon from terrestrial ecosystems (Huggins et al., 1997).

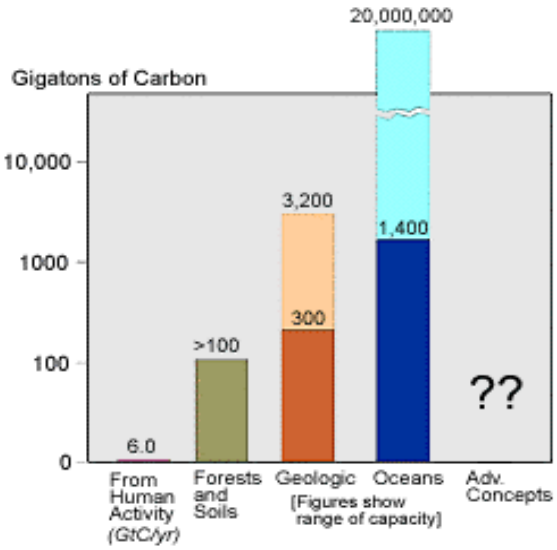

Fig. 1. Carbon Sequestration Capacities

Air quality has become one of the leading environmental concerns in the United States and

agricultural tillage is one of the leading cropping practices that adversely affects air quality. CRP field enrollment can control the amount of total carbon and nitrogen within a terrestrial ecosystem. Baer, Rice, and Blair (2000) determined that CRP promotes soil restoration, but argued that ten growing seasons (usually the length of a CRP contract) is not an adequate time for recovery of total soil carbon and nitrogen pools. In fact, agricultural practices contain the potential to sequester more carbon in soil than farming emits through land use and fossil fuel combustion.

With long-term land enrollment of these systems under CRP and CREP, increased air quality benefits can be achieved, and through identification and enrollment of CRP-eligible land within essential ecosystems, it could provide excellent air quality improvements and associated improvements in water quality and wildlife habitat enhancement.

SECTION 3
SOCIOECONOMIC EFFECTS

3.1 COST-BENEFIT ANALYSES

There are environmental and economic benefits and costs of the CRP (see Figure 2). Some of these benefits and costs affect the quantity and quality of goods and services received by society (e.g. recreational fishing water quality, air quality, the costs of cleaning sediment from drainage ditches, the cost of treating groundwater, et cetera).

Some of these benefits and costs are transfer payments in which funds are shifted from one sector of the economy to another (Jaroszerwski, Poe and Boisvert, 2000; Smith, 2000; Osborn, 1997; Hughes et al., 1995; Young and Osborn, 1990). Transfer payments do not directly result in changes in the quantity or quality of goods and services provided in society, since no new output is being created. Price support and CRP rental payments are transfers from the government to landowners. Typically, the costs and benefits of transfer payments cancel out. A $100 rental payment from the CCC to a landowner is a cost to the government but a benefit to the landowner. One USDA analysis indicates that wheat, corn, and soybean prices would rise to 12, 15, and 13% respectively, compared with no CRP (Smith, 2000). From an economic stance, this cost is a transfer from consumers to producers and is a wash in cost-benefit calculation. There are social impacts, however, from this re-distribution of funds. For instance, higher food costs disproportionately impact low-income consumers who spend a higher percentage of their income on food than high-income consumers do. The impacts wrought by the spending of dollars in the government sector versus the household sector are studied in economic impact studies, which examine the distribution of employment, sector income, and household income. Economic impacts are addressed in a subsequent section.

It should be noted, that some of the most comprehensive cost-benefit studies of the CRP have been done by the USDA-ERS, and include increases in food prices that may result from a decrease in the supply of cropland available for cultivation and transfer costs (USDA-FSA, 1997b; Barbarika and Langly, 1992; Young and Osborn, 1990).

The costs of CRP are more easily quantified and monetized than the benefits. It is an easier task to estimate the costs that would be avoided of mostly marketed goods and the government payments made, than it is to estimate the benefits of environmental goods, with the latter including items like improved water quality, restoration of wetland functions and endangered species habitat, and wildlife viewing. Non-market valuation techniques are typically used to estimate these benefits. These techniques include direct methods; such as contingent value, contingent choice and contingent behavior surveys, and indirect methods; such as averting expenditure and cost of production studies, and hedonic property and travel cost valuation models. The contingent valuation method, the direct method, which is the most commonly used, involves surveys of stakeholders and the public concerning hypothetical conditions. The indirect methods are based on observable market transactions (e.g. expenditures to treat polluted water, production costs, home sale prices, and travel costs to a recreational site). In both direct and

indirect methods, a statistical model is run and the implicit or marginal price of an environmental quality attribute is estimated. Courts and peer review have alternately upheld the results of these studies as best estimates or criticized them for their bias or misspecification. Study methods employed are often restricted by time and funding availability. The result is that not all of the benefits of CRP have been quantified to date.

Since it has been difficult to quantify all of the benefits of CRP, non-market valuation and structural modeling techniques have been used to quantify, and often monetize, what are thought to be the major practices and those whose improvements are listed as the CRP's primary objectives. USDA-FSA (1997b) monetizes the improvement to surface water quality, but states the benefit of fertilizer and pesticide reduction in tons used. Classen, Hansen et al (2001) monetize the benefits of soil erosion reduction and wildlife habitat improvement, and indicate that other benefits not quantified in their analysis are increases in waterfowl populations, cleaner coastal and estuarine recreation areas, improved survival of threatened and endangered species, and improved quality of commercial fisheries. USDA-ERS (2000a and b) contain comprehensive lists of environmental benefits.

Several studies have not directly valued changes in all resources from CRP, but have modeled changes in net returns to farmers from changes in these resources. Ribaudo, Colacicco et al. (1990), Moorhead and Dangerfield (1996), and Goodwin and Smith (2001) estimate the tons of soil erosion reduction under CRP as well as income changes due to improved soil productivity and reduced fertilizer usage. De La Torre Ugarte et al. (1998) use the POLYSIS model of the economy, which includes demand, supply and environment modules, to estimate changes in net returns to farmers from changes in soil erosion, nitrogen and phosphorous runoff and leaching, nutrient availability, organic carbon, soil structure and pH, water-holding capacity and, and pesticide indicators.

Benefits

Decreased costs of surplus commodity production and storage
Increased future supplies of timber
Lower administrative costs for conservation compliance, sodbuster, swampbuster
Improvement in groundwater quality
Improve surface water quality
Reduced irrigation pumping costs
Higher farm income due to price increases
Increase in farm wealth/asset base due to timber
Protect soil productivity/food production asset base
Reduce wind erosion/improve air quality
Consumptive benefits of small and big game wildlife (=hunting, fishing, sporting clays)
Improve groundwater quality
Savings on groundwater pumping and treatment costs
Aesthetic improvements
Nonconsumptive benefits of wildlife (=viewing; camping, hiking, picnicking, nature study, photography, ecological value)
Improved wildlife habitat
Decreased pesticide use
Increased/improved freshwater-based recreation
Threatened and endangered species protection
Reduced nutrient damages
Reduced flooding damages
Increased/improved carbon sequestration
Reduced dredging costs
Cleaner coastal and estuarine recreation areas
Improved quality of commercial fisheries
Income stability
Decreased need for credit
Increased land values
Increase in reservoir capacity from lower sedimentation

Sources: (Claasen, Hansen et al., 2001); (Hughes et al., 1995); (Vanderhoe, 1995); (Young and Osborn, 1990); (Ribaudo, Colacicco et al., 1990); (Ribaudo, 1989).

Costs

Higher production costs from crop restructuring and a reduction of acreage over which to spread fixed production costs
CRP administrative costs
Costs to farmers and government to establish cover crops
Technical assistance costs
Increased consumer (domestic and foreign) food costs
Rental cost payments
Negative impacts on local farm economies from decreased demand for agricultural inputs, labor, crop storage and processing
Increase in noxious weeds

Sources: (USDA-FSA, 1997b); (Hughes et al., 1995); (Young and Osborn, 1990).

Fig. 2. Benefits and Costs of CRP

Several studies have not directly valued changes in all resources from CRP, but have modeled changes in net returns to farmers from changes in these resources. Ribaudo, Colacicco et al.

(1990), Moorhead and Dangerfield (1996), and Goodwin and Smith (2001) estimate the tons of soil erosion reduction under CRP as well as income changes due to improved soil productivity and reduced fertilizer usage. De La Torre Ugarte et al. (1998) use the POLYSIS model of the economy, which includes demand, supply and environment modules, to estimate changes in net returns to farmers from changes in soil erosion, nitrogen and phosphorous runoff and leaching, nutrient availability, organic carbon, soil structure and pH, water-holding capacity, and pesticide indicators.

More prevalent than comprehensive cost-benefit studies are CRP benefit studies. These include:

- water quality improvements that benefit recreation, reduce dredging and water treatment costs, and improve the productivity of commercial fisheries (Ribaudo, 1989);
- improved soil productivity, groundwater supply, water and air quality, and wildlife habitat (Ribaudo and Colacicco, 1990);
- improved freshwater recreation, pheasant hunting, and wildlife viewing (Feather et al., 1999)
- improved lake water recreation (Douglas and Johnson, 2001; Feather and Hellerstein, 1997);
- increased 'social benefits' from CREP in New York (Jaroszerwski, Poe and Boisvert, 2000);
- improved freshwater recreation, soil productivity, health, wildlife viewing, and pheasant hunting (Claasen, Hansen et al., 2001); and
- recreation water quality improvements.

In a comprehensive analysis of benefits, wildlife habitat improvements have been found to comprise the largest single category (USDA-FSA, 1997b; Hoag, 1999).

3.2 BENEFIT-COST MEASUREMENT

The benefits achieved from CRP are highly dependent on program objectives. When the CRP program was first implemented, there was a single primary objective, protecting soil productivity, and a secondary objective, income support and price stability. The passage of the 1990 farm bill explicitly expanded the program scope to include multiple objectives: protecting soil productivity, improving water quality, and creating wildlife habitat. It is more difficult to incorporate multiple objectives into a benefit-cost measurement tool, as not all objectives may be met with maximum efficiency (Ribaudo et al., 2001).

To maximize the benefits and respond to the need to keep enrollment below the acreage cap, a national ranking system was developed by the USDA. The Environmental Benefits Index (EBI) awards points to applicants based on practices intended to meet environmental goals and the density of population to enjoy the off-site benefits. The EBI is structured to maximize the environmental benefits-costs ratio (Osborn, 1997). A more detailed discussion of the EBI appears in the discussion on ***Efficiency and Cost Effectiveness.***

The EBI only considers the benefits to society. Since CRP is a voluntary program, landowners must have an incentive to enroll. This means that the private marginal benefits he or she receives

from implementation of the practice (the rental payments minus their cost share, and a reduction in income variability risk) should equal or exceed the marginal cost (i.e. the value of the land for some alternative use such as agricultural production or urban development). There should also be flexibility in implementation since a farmer is taking a risk of retiring a productive asset for a long time (Classen and Hansen, 2001; Amosson et al., 1997).

In other words, the rental value of the CRP ought to represent the opportunity cost to the landowner of not farming the land. A landowner would consider a) the cash or share rent he or she could receive for the land if it were rented, b) the profit that could be earned by a farmer-owner who produces crops on the land; and c) the value of an annuity that could be purchased with the proceeds from the property's sale. If the CRP rental payment to be received were at least equal to this foregone cash flow, the landowner would be indifferent between farming, selling, or retiring the land (Amosson et al., 1997). If the CRP payment were greater than this opportunity cost, the more profitable option would be to enroll the land in CRP. In nonmetropolitan counties enrollment is found to significantly increase with a rise in CRP rents (Plantinga, Alig and Cheng, 2001).

CRP enrollment has had a propensity to be low in states where the opportunity cost of enrollment is greater than the dry land rental rate. This is where most of the dairies, irrigated land, and thinly traded land markets are located (Heimlich, 2002; Kingsbury et al., 1999; Bills and Force, 1989b). For dairies and livestock producers, the rental rate does not represent the foregone income from the crop that would have to be purchased as feed. The lost rental value usually does not compensate for having to purchase additional feed, and for this reason, enrollment in the Northeast has been low. Irrigated land in Western states face the same difficulty. Depending on the state, if water is idled, the farmer might have to use the water elsewhere or lose his right to it. In areas where tree planting is the practice of choice, such as the Southeast (Smith, 2000; Kurtz et al., 1996), the CRP program is popular because the landowner is essentially being given financial incentives to invest in a productive enterprise that will build future value (Moorhead and Dangerfield, 1996). The alternative for this landowner is to plant the trees and not enroll in the CRP. The time until harvesting would be comparable under both options, but under the non-enroll option, the owner would not receive rental payments.

In western and eastern states, dry land cash rental rates often do not reflect the value of irrigated land or land near growing urban areas. Higher payments are effected through state and federal financial incentives. These higher government payments are justified by improvement in societal welfare from the preservation and restoration of environmental goods. Several studies have found that the average annual societal willingness to pay for the amenity values of agricultural land is one to two times the annual rental value (Poe, 1999). The off-site costs of soil erosion, and pesticide and fertilizer runoff erosion-related pollutants are further justification for higher rental payments. These costs are not uniform across regions, with higher damages per ton of eroded soil in areas where there is high demand for surface water consumptive and non-consumptive uses (Poe, 1999).

The CREP program has been successful in some states, particularly Illinois, because the total annual payment received by a farmer reflects the higher opportunity costs of much of the eligible land (Jaroszewski, 2000; USDA-ERS, 2000c; Lynch and Brown, 2000). This is particularly true

in urban fringe areas, on land where high valued specialty crops are grown, and where development potential drives up land values higher than agricultural land values (Kingsbury et al., 1999; Cooper and Osborn, 1998; Parks and Schorr, 1997).

Cash flow is not the only important item in determining opportunity cost. The interest rate used to discount the stream of payments and expenditures over the life of the contract represents risk over the contract period. This risk includes foregone opportunities for agricultural production, inflation, and land use restrictions. The higher the interest rate, the lower the present value, and the less likely a CRP/CREP offer is to be competitive with other land use practices. Establishment cost reimbursement is also an important financial consideration. The 75% cost share percentage in North Carolina is thought to be a disincentive because in most other CREP states, cost sharing provides 90 – 100% of the practice installation cost (Smith, 2000). The higher the cost-share percentage paid by the government, the more likely it is that a landowner would participate (Kingsbury et al., 2002; Lichtenberg, 2001). Lichtenberg (2001) estimated that a 1% reduction in the cost of waterways, strip cropping and contour farming should increase the probability of CRP adoption by 30 – 40%; and that a 1% reduction in the cost of terraces and diversions would increase the probability of adoption by 20 – 30%.

The land use restriction during the contract can influence the market value of the land if it were to be sold (Lynch and Tjaden, 2000; Amosson et al., 1997). The direction of the influence will vary depending on buyer expectations about crop prices and preferences for a steady income (Lubben et al, 2001; Hughes et al, 1995; Napier, 1987). In a study of CRP land in North Dakota, Shultz and Lambert (1999) found that that the annual land rent increase due to the average increase in the number of CRP acres was about 5.6%. This restriction acts to increase the risk premium added to the discount rate used in determining opportunity cost tradeoffs.

The risk premium added to the discount rate for the land use restriction could be reduced if limited haying and grazing (Hughes, Hoag and Nipp, 1995; Hughes et al., 1995) and the production of bioenergy crops (Walsh, Becker and Graham, 1996) were permitted. However, support for haying and grazing may not be uniform. One survey found that a higher percentage of farmers, 66.7% , would re-enroll with no haying or grazing permitted than with limited haying and grazing, 59.3%. The higher acceptance rate with no haying and grazing permitted is that there would be additional oversight required. There was stronger support for re-enrollment with limited haying and grazing by livestock farmers than crop producers (Cooper and Osborn, 1998). Existing emergency haying and grazing provisions in the CRP were criticized for depressing hay prices, putting hay sellers at a disadvantage (Hudur et al., 2002).

Landowners are also concerned that their land will be subject to restrictions upon expiration (USDA-ERS, 2000c). A national study found some farmers were reluctant to enroll in continuous sign-up because they thought a voluntary program would become mandatory and they would be required to maintain their practices (Applied Research Systems, 1996). Responses to a survey of riparian landowners in Oregon indicated concern that their land would be subject to the Endangered Species Act after the end of the CREP contract because the riparian buffers were helping to restore endangered salmon and trout habitats (Kingsbury et al., 2002; USDA-ERS, 2000c). In response to a concern by Maryland landowners that their CREP enrolled land would be regulated as wetlands after the contract ended, the state adopted a provision that

gave the owner 5 years after contract expiration to resume crop production (Lynch and Tjaden, 2000).

3.3 EFFICIENCY AND COST -EFFECTIVENESS

The cost effectiveness of a policy refers to the maximization of benefits obtained per dollar spent. In the context of the CRP, to maximize the benefit-cost ratio one must target land for enrollment whose benefits exceed their costs. Irrigated land and high value production land may offer substantial benefits if retired, but the rents for this land are some of the highest in the country, resulting in benefit-cost ratios that are less than one. Less productive agricultural land (such as cropped wetlands) and land in markets with decreasing land values due to drops in demand may be more efficient at maximizing benefits relative to cost and more attractive for enrollment (Ogg et al., 1989). Cropped wetlands are one example of this. Enrollment criteria, competitive bidding, and the EBI are used to target CRP program dollars.

Several economists have written about improving the cost effectiveness of CRP through the linking of GIS (Geographic Information Systems) and economic optimization models (see Yang et al., 1999; Feather et al., 1999; Babcock et al., 1996) and many others about the importance of targeting environmentally sensitive land parcels (Heimlich, 2002; Hoag, 1999; Hughes et al., 1995). One study identified CRP lands to be targeted for re-enrollment when their contracts expired, given likely post-expiration land uses (Rickerl et al., 1999). Rickerl's study used GIS-based information and CRP tract maps to identify tracts in the watershed critical to groundwater quality, surface water quality, and wildlife enhancement. Other tracts not targeted for re-enrollment were most appropriately returned to pasture or row crop production. This type of spatial analysis could improve cost effectiveness by looking at the cumulative environmental effects of re-enrollment and enrollment of new land.

When the CRP was first passed in 1985, the primary goals were to reduce soil erosion, preserve soil productivity, and control crop supply. Secondary objectives included reducing groundwater contamination and mining, and improving surface water quality. Land was enrolled whatever it met the eligibility criteria, and the rental rate requested was less than the maximum acceptable rental rate (MARR), an unpublished number. The enrollment criterion meant that the primary objective was being met, but that land was not being enrolled in a cost effective manner that could also meet the secondary objectives (Miranowski, 1988). As long as neither the program acreage cap nor the 25% county enrollment limitation was exceeded, there was no assurance that the benefits obtained per dollar spent on the program were maximized. In response to the acreage cap being neared, in 1990 the first ranking system for applicants, the Environmental Benefits Index (EBI), was developed. Since then, different rating systems have been simulated to determine if environmental benefits are being maximized and/or if the program is being run cost effectively (Babcock et al., 1996; Yang et al., 2001).

One of the first studies advocating the targeting of CRP land suggested that the goals of cost reduction and erosion management were to some extent mutually inconsistent and that optimal erosion control would be quite costly (Reichelderfer and Boggess, 1988). From 1986 – 1989, all eligible land (i.e. that met the erodibility restrictions) was able to enroll in CRP as long as the rental rate was less than the MARR for the county. This method was not cost-effective because

it was not competitive and often resulted in rental rates that exceeded the rental value of farmland. Others thought that similar soil erosion goals could be met at lower cost through erosion control measures (Goodwin and Smith, 2001) or by a regionally 'unbalanced' land retirement approach (Ribaudo et al., 1994).

In preparation for the 1990 Farm Bill, the USDA undertook two analyses. The first examined expanding eligibility to irrigated land on highly saline soils, irrigated land in ground water depletion areas, land in watersheds with pollution problems, and cropped wetlands. The enrollment of irrigated land would not be cost effective, while the enrollment of land in watersheds (particularly in buffer strips) and of cropped wetlands would (Ogg, et al., 1989).

The second analysis compares the Baseline Scenario, with existing eligibility and enrollment, with alternate targeting scenarios: a forestry emphasis and an environmental emphasis (Ribaudo et al., 1990). The amount and distribution of increased soil productivity and groundwater supply, improved water and air quality, and improved wildlife habitat are compared with the Baseline:

1) The Forestry Scenario: land is targeted so that it is planted with trees after retirement.
2) The Environmentally Sensitive Scenario: environmentally sensitive land is targeted.

The benefits are highest for the forestry scenario ($7.2 billion - $15.7 billion), followed by the environmental scenario ($6.8 billion - $14.9 billion) and the baseline scenario ($6 billion - $13.6 billion). These results lay the basis for development of the EBI.

Three overall policy choices have been advocated to make CRP more cost effective:

1. Agri-environmental payments a.k.a. 'green payments'

These payments are made to a landowner based on the cumulative effects of conservation practices on a farm. It is a holistic approach based on complimentarity of all the practices on agricultural land, whether in production or not (e.g. CRP, EQIP, WHIP, conservation compliance, low till farming), and whether funded by the federal, state or local government (WMI, 2001; Claasen, 2001; Poe, 1999). The Conservation Security Program, was one of the centerpieces of the Senate-passed version of the 2003 Farm Bill (S. 1731).

The partial substitutability of one conservation practice with another was demonstrated in a GAO survey sent to State Technical Committee members to determine the effectiveness of conservation programs. WRP and EQIP were rated comparable to general CRP in protecting or improving surface water quality. WRP and WHIP were thought to be superior to all CRP programs in protecting native species. EQIP and general CRP were rated about the same. General CRP was thought to be slightly superior to continuous CRP, CREP and EQIP in reducing soil erosion. WRP, EQIP, and the CRP programs were thought to be comparable in protecting or improving ground water quality (US Government Accounting Office, 2002).

Green payment programs can also be structured with performance-based payments. These produce greater benefits to society and a producer than practice-based payments (Claasen and Hansen, 2001; Yang et al., 2001). The farmer can decide the most cost effective manner to

achieve a goal (e.g. nitrogen reduction, decreased water turbidity from run-off) and society only pays for the benefits it receives.

2. Use of a benefit-cost index

The Environmental Benefits Index is currently used to rank CRP applications. The EBI has evolved over time to include various factors (see Figure 3).

There are several criticisms of the index. First, enrollment is constrained in any county based on the 25% enrollment limit per county (Babcock et al., 1996). Second, watersheds are not targeted (except in the CREP program), so that there may be few cumulative impacts of enrolling a piece of land. Many of the environmental impacts occur on a local watershed or ecosystem basis (Yang, Khanna et al., 2001; Johnson and Clark, 2001; Ribaudo, Colacicco et al., 1990). This was one of the motivating factors behind developing the CREP program in 1996 to address non-source agricultural pollution problems and riparian habitat restoration (Jaroszerwski, Poe and Boisvert, 2000). Researchers have studied this issue using the Natural Resource Inventory (NRI) as a proxy for ecosystem conditions (Babcock et al., 1996; Feather et al., 1999) and used integrated watershed management models comprised of hydrologic, economic and GIS components (Yang, Khanna et al., 2001; USDA-FSA, 1997b; De La Torre Ugarte et al., 1995, 1996). Third, the EBI weights do not reflect the importance of the various benefit categories held by people (Johnson and Clark, 2001). Wildlife has consistently been found to receive the highest ranking (Feather et al., 1999; Hoag, 1999; USDA-FSA, 1997b; Young and Osborn, 1990). However, the EBI index does not give it the largest weight. One of four scenarios analyzed in the Benefit Cost Analysis prepared by the FSA for the 1996 Farm Bill included an EBI weighting scheme that incorporated importance weights (USDA-FSA, 1997b). Compared with the three other weighting schemes, the weights given to wildlife and water quality were much larger while the weight for soil erosion was much smaller. This may be because these are resources used in consumptive recreation, while the other major benefit category, soil erodibility, is more crop production based. Supporters of the EBI, who realize its shortcomings, nevertheless advocate its use to reflect society's changing objectives for the CRP program (Ribaudo, Hoag et al., 2001; Feather et al., 1999; Smith, 1996).

In signups 10-12 (1990-1993), the EBI was comprised of seven coequal factors:

- surface-water quality
- groundwater quality
- soil productivity
- conservation compliance assistance
- tree planting
- Hydrologic Unit Areas identified by the USDA Water Quality Initiative
- conservation priority areas
- cost

In Signup 13 (1995), the EBI was comprised of five factors:

- water quality
- wildlife habitat
- soil erodibility
- tree planting
- cost

In Signups 15 –20 (1997-2000), the EBI was comprised of seven factors:

- wildlife habitat (100 points max.)
- water quality (100 points max.)
- erosion (100 points max.)
- enduring benefits (50 points max.)
- air quality (35 points max.)
- CPA (25 points max.)
- cost (points unknown)

Sources: (Heimlich, 2002; USDA-FSA, 1999; USDA-ERS, 1997, Section 6.2 and 6.3).

Fig. 3. Evolution of Environmental Benefits Index (EBI) Factors
The EBI expresses the value of landscape variation as changes in factor and subfactor scores (USDA, 1999).

Fourth, that the EBI is a national ranking system, reflecting national values and objectives (Poe, 1999). The benefits enjoyed and the damages avoided may vary by spatial extent. Aesthetic and recreational benefits may be greater in more populated urban fringe areas than in areas of the Northern Plains, where wildlife habitat and soil productivity preservation are more important. River water quality in a river whose water is used as an input to an industrial process may be of primary importance to riverfront communities and of lesser importance to communities downwind of high wind erosion areas.

3. Integrated hydrologic, economic and land use models

One way to cost effectively target benefits under CREP is to tie rental payments into the cost of achieving program goals rather than to a fixed rental rate. Payments are based on actual results, not intentions (ERS, 2001). For instance, a study of the Illinois CREP program examines the most cost effective way to achieve a 20% sediment loading reduction (Yang et al., 2001). The same goal can be reached by paying a fixed rental payment per acre or by paying a per ton abatement cost. The latter is more cost effective, requiring a lower amount of public funds.

These types of models examine enrollment impacts on a more environmentally friendly scale,

that is, at the ecosystem or watershed level. State CREP programs are good examples of integrated, cost effective programs. Most CREP programs are organized on a watershed basis. Yang et al (2001) use a comprehensive model to compare the benefits achieved when there are uniform and non-uniform performance objectives and financial incentives. The model incorporates the fact that off-site abatement benefits are not uniform across parcels and depend on the sediment transport coefficient, the parcel's site-specific characteristics (e.g. slope, soil characteristics and distance from a water body) land use, and the site-specific characteristics and land use of parcels lying between the parcel and the waterbody. The performance objective is 20% sediment abatement in each of 12 watersheds, or a 20% sediment abatement across 12 watersheds. Two payment mechanisms within each standard are examined: one, where the rental payment is based on the per ton abatement cost and the other, where the rental payment is fixed per acre enrolled. The model is applied to 12 watersheds in the Illinois CREP region, where the sediment reduction goal is 20%. The most cost effective policy is the non-uniform standard with a per ton of abatement rental payment.

Development of integrated spatial models to analyze the effects of CRP and other soil conservation programs on ecosystems, land uses, and human communities is the necessary next step in quantifying the benefits and understanding the incremental impact of CRP practices and eligibility criteria. Several leading researchers, whose work is cited in this report, indicated by e-mail correspondence the need to fund and make information available for interdisciplinary studies.

3.4 RE-ENROLLMENT

When enrolled land is returned to production, many of the benefits from retiring the land are lost. The re-enrollment of land in CRP can maximize society's benefit-cost ratio. Most of the establishment costs were already spent by the government and owner/operator during the initial enrollment period, and the practice is fully established. During the re-enrollment period there would be benefits right away, and no initial establishment cost. It is important to provide incentives for farmers to maintain these practices and re-enroll. Tree planting is a practice that has a built-in financial incentive – an increasing asset base. Even if rental payments for trees are reduced, the benefits to the landowner are the increasing stumpage values.

A number of surveys and studies were undertaken in the first half of the 1990s to prepare policymakers and resource managers for the possible impact of large amounts of acreage leaving the CRP if a) the program was not renewed or b) re-enrollment was low due to recovering food prices. Even if the program were extended, over 20 million acres under contract were set to expire in 1996 and 1997 (Barbarika, 2000). Studies on land use after contracts expired were undertaken nationally (De La Torre Ugarte et al., 1995; Dodson et al., 1994) and at the state level, including Iowa (Jolly et al., 1995; Nelson et al., 1994); Montana (Johnson and Zidack, 1997); Kansas (Langemeir et al., 1996); Oklahoma (Dicks, 1996); North Dakota (Gustafson and Hill, 1993); and Alabama (Onianwa, 1999).

A national survey of 17,999 CRP enrollees was undertaken by the Soil and Water Conservation Society in 1993 to understand landowner incentives to re-enroll. The results indicated that approximately 63% of the CRP land would return to production (Diebel et al., 1996; Dodson et al.,

1994). At the same time, regional study groups were formed between land grant universities and extension branches to research what might happen if CRP were to expire. The results were similar with 60 – 65% of the currently enrolled landowners would re-enroll if the program continued. The same percentage would re-crop if the program expired (Bangsund et al., 1994; Dodson et al., 1994; Nelson et al., 1994; Jolly et al., 1995).

In another study, farmers were asked if they would be willing to enroll in the CRP at lower, the same, or higher rates with limited haying and grazing permitted, or with no haying and grazing permitted (Cooper and Osborn, 1998). The results differed by type of farmer and scenario. When no haying or grazing was permitted, crop farmers had a higher probability of renewing at lower rental rates than livestock farmers renew, and a lower probability of renewing at higher rental rates. When haying and grazing were permitted, livestock farmers had a higher probability of renewing at all rental rates. This data used was from 1993, however, and does not reflect post-FAIR passage farm program changes.

At the expiration of a CRP contract, farmers who produce both crops and cattle are less likely than crop producers to indicate they will return CRP land to production post-contract expiration. Irrigated land is more likely to be converted, as are larger tracts. This implies that smaller tracts in the continuous sign-up and CREP programs are more likely to have enduring benefits than larger tracts. Retired farmers are also less likely to return land to production (Claasen and Hansen, 2001).

Other studies found that:

- If contracts expire, approximately 40% of farmers would return to cropping and 30% would use the land for hay or pasture (Applied Research Systems, 1996);
- Timber production has the highest retention rates (Onianwa et al., 1999; Moorehead and Dangerfield, 1996; Kurtz et al, 1996; Kurtz et al, 1980;). A study of forest retention rates under earlier tree planting programs indicated high retention rates: 80% in the Soil Bank Program, 89% in the ACP and 96% in the FIP (Kurtz et al., 1996). Based on the experience under the Soil Bank program, only 2.3% of all acres planted to trees returned to crop production and 5% reverted to pasture use. Onianwa et al. (1999) also found a high tree retention intention of 90% in Alabama.
- Almost two-thirds of the CRP acreage is likely to return to crop production, with most being planted to wheat, corn, or soybeans. Approximately one-third of CRP acres in the Northern and Southern Plains would likely remain in grass production for haying, grazing, and wildlife habitat. The highest percentage of re-cropped CRP land should be in the Cornbelt, Lake, and Pacific states. Sixty to seventy percent of CRP acreage planted to trees, particularly in the Southeast and Delta states, would likely remain in trees (Onianwa et al, 1999; Diebel et al., 1996).
- Re-enrollment patterns in South Dakota would be highest for land with average yields, where the CRP payments were comparable to the net returns of cropping. For land with low crop yields, range or pasture use was more profitable than enrollment in CRP. Re-cropping produced the highest net return for land with high yields (Janssen et al., 1997).
- Over ninety percent of CRP land in North Dakota would return to crop production or pastureland if the contracts are not renewed. Fifty seven percent of CRP participants wanted permanent CRP contracts, while eight-four percent wanted ten-year extensions (Gustafson and Cole, 1993).

3.5 ECONOMIC IMPACTS

'Economic impacts' were mentioned in the **Cost-Benefits Analysis** section. Many of these impacts are not necessarily measured as a cost or benefit since they are changes in income and employment effected through the redistribution of spending in an economy. CRP basically takes money from the taxpayers and gives it to landowners. In return, taxpayers receive many environmental as well as food security benefits. The economic impacts are largely felt in local (i.e. town and county) economies. The outcome of this redistribution is highly dependent on the type of land cover established, the percent of cropland enrolled in the CRP, the diversity of the local economy, the value of crop production foregone on enrolled acreage, and the interaction of these variables.

The economic impacts are primarily felt in the agricultural sectors of the economy (Hodur et al., 2002). Changes in expenditure functions are what makes the difference with money that was once being spent on agricultural inputs, (e.g. fertilizer, labor, seeds) now spent in the consumer goods and services sector (Bartlett, 1987; Woods and Sanders, 1987; Flora and Flora, 1987). Areas with a high dependence on livestock and crop production generally suffer negative economic impacts if a high percentage of the land is enrolled (Hines et al., 1991). At the sub-county level, however, the impact on the agricultural input sector has been found to be nominal (Leistritz, 1998; Miranowski, 1988).

If the retired land is planted to trees with long-term stand management, there can be positive economic impacts from job creation. For example, a study of enrolled land in Georgia, where most of the land is planted to trees, indicates the creation of 500 jobs and a $9 million increase in annual personal income (Moorhead and Dangerfield, 1996). Positive impacts can also accrue if the creation of wildlife habitat attracts non-resident hunters and if improvement in water quality attracts non-resident anglers (Young and Osborn, 1990; Ribaudo et al., 1990; Ribaudo, 1989; Harmon, 1987).

As part of the policy formulation process for the 1996 Farm Bill, extensive analysis was made of the impact of changes in the CRP on the farm economy. Dynamic structural models of the national economy were developed by the Center for Agricultural and Resource Development at Iowa State University and other agricultural policy centers that incorporated changes in agricultural inputs and consumer markets. State level studies were also done and the state results funneled into regional models (Leistritz, 1998; Janssen et al., 1997; Diebel et al., 1996; De La Torre Ugarte, 1995). The most common CRP scenarios analyzed were program termination, full program extension, and extension with a reduced acreage cap. One such model, developed at the Agricultural Policy Analysis Center at the University of Tennessee and the Great Plains Agricultural Policy Center at Oklahoma State University was POLYSIS. POLYSIS contains two modules related to the farm-sector:

1) *Supply Module*: The supply module uses a linear programming model to estimate planted and harvested acres, yield, production costs, program participation and acreage, and incorporates rotations and soil types. The objective is to maximize net returns above variable costs.

2) *Demand Module*: This module uses a national econometric model to estimate prices, domestic demand, exports and inventory of seven major crop and seven major livestock categories.

Static structural models of the economy that are based on input-output accounting, have also been used (Janssen et al., 1997; Hines et al., 1991).

The national economic impact of the CRP is nominal. If the CRP were ended, on a national level the decline in farm incomes would most likely be offset with increases in jobs as more land is placed back into production, particularly in regions where the percentage of total employment in farming and agribusinesses is high. The Corn Belt would be expected to experience the largest drop in farm income, a 7.5 – 12% drop. The drop in the Northern and Southern Plains is expected to be 3 – 5% (Dodson et al., 1994).

The higher the level of spatial aggregation of CRP enrollment, the lower the impact. For instance, Leistritz (1998) found that the impact of CRP enrollment in all regions of North Dakota from lower agricultural input expenditures, was less than 1% in both value added and loss in annual employment. At the same time, household income effects were positive, due to the net gain in income from rental payments, and the stabilization of household income and spending. In South Dakota, a simulation found that a policy change from full CRP extension to no CRP caused total value added to decline by up to 1.45% in less CRP dependent regions, and to increase by up to 1.59% in more CRP dependent regions. Statewide, the change was -0.4% (Janssen et al., 1997). In another study, the economic impacts of CRP in 10 multi-county regions, where 15 – 25 % of the cropland was enrolled in CRP, were found to be minimal, with the exception of input suppliers. Income reductions for input supply sectors ranged from <1% to 5.7% (Hines et al., 1991).

It is the local, township level where changes in the distribution of spending and income can make a difference, although CRP enrollment data at the town level has not been available to study these differences (Hamilton and Levins, 1997).

3.6 SOCIAL IMPACTS

One of the criticisms of the CRP program is that it siphons money produced by a community's asset base, farmland, out of the local economy. Purchases of inputs, farm labor, and business services decline. Over intermediate periods of time this can lead to population decline. Population loss, combined with a decrease in the local tax base, could cause a loss in the provision of community services such as schools, utilities, and health care with the disruption of community institutions such as houses of worship and volunteer organization (Hodur et al., 2001; Woods and Sanders, 1987).

Social impacts occur as a result of decreased economic activity in a community, and a change in land ownership characteristics. Retired farmers who enroll their land in CRP and live outside of the community cash their rental checks elsewhere, not investing or spending the earnings from a community's asset base. In 2000, limited resource and residential/lifestyle farms received 49% and 35%, respectively, of their total government payments from the CRP. CRP payments

represented 1% or less of average gross cash farm income for large farms (USDA-ERS, 2001). Medium farmers are more likely to spend their income in a community than are large farmers (Flora and Flora, 1987).

High CRP enrollment may increase land prices. The wealth effect occurs when CRP payments are higher than the opportunity cost of the parcel in agricultural production, and there is less land available for production (Hughes et al., 1995; Miranowski, 1988). The increase in land values could have the effect of impeding beginning farmers from acquiring land, and by accelerating the concentration of land ownership in large farms (Lubben et al., 2001; Napier, 1987).

One of the positive impacts of CRP, depending on the density of population in nearby areas, can be the preservation of open space. Farmers may retire or feel more comfortable working off the farm, or not developing the unused farmland by enrolling it in CRP (Hodur et al, 2002). For retired farmers, the open space benefits may only be temporary, as they wait for development pressures of the urban fringe to approach. For instance, Parks and Schorr (1997) found that increasing development pressure and a high proportion of recreational farms were negatively correlated with CRP enrollment.

Almost all of the social impact analysis has been studied using county level data. This data may not reflect the localized impacts of high enrollment within specific communities. The general lack of CRP data availability at the township level has prevented much study in this area, although there has been a desire by the scientific community to do so. One study found the socioeconomic analysis using county level data showed no significant impact. However, a different picture was painted using regression analysis with county data and descriptive statistics on a subset of zip codes in which more than 15% of the land was enrolled in the CRP. At the community level, the proportion of farm population was higher, average farm income and median household income were lower, and the population per zip code was lower than the county aggregated data. Using regression analysis with this sub-county data, CRP acreage was found to be statistically significant in determining community well-being (Hamilton and Levins, 1998). Findings from the study suggested that the policy of capping CRP enrollment at 25% of a county's cropland acreage should be retargeted to limits at the township level.

3.7 SLIPPAGE

Slippage occurs when a landowner that enrolls land into CRP increases production on other land to compensate. Strategic sod-busting, a similar term, occurs when a landowner that enrolls land into CRP brings marginal land into crop production. Both practices have the effect of reducing the benefits gained from retiring land under CRP, and impairing cost effectiveness. Slippage and strategic sod-busting are terms that are often used interchangeably.

There are several reasons slippage and strategic sod-busting occur. First, more land is cultivated in response to commodity price increases that result from the decrease in the supply of producing land that results from CRP enrollment in a county or region. Second, slippage may occur because the owner is receiving a steady income from the retired land and is willing to take more risk by farming marginal land.

Wu (2000) estimated the nationwide slippage to be 20%. Slippage was higher in the Corn Belt (30%) and lower in the Lake States and Northern Plains (16% and 15% respectively). A reduction in overall water quality benefits due to slippage has been estimated at about 5 – 10% (Wu, 2000; Ribaudo, 1989). Goodwin and Smith (2001) estimate nationwide slippage at about 25%. They found that the CRP has reduced erosion an average of 1.5 tons per acre, but that about 25% of this reduction has been offset by increased erosion that result from crop insurance, disaster relief, and other income support programs.

A type of reverse slippage was found in a recent survey of State Technical Committee members (GAO, 2002). To become eligible for enrollment, landowners may farm marginal or highly erodible land, not install a conservation practice they normally would have on their own, or discontinue the use of an existing conservation practice.

Slippage was foreseen as a potential problem from the program's inception. Woods and Sanders (1987) predicted the possible increase in "wildcat" farming outside government programs, leading to uncertain erosion effects. One way to reduce slippage is to change CRP eligibility criteria to allow the enrollment of environmentally important non-cropland acreage (Wu, 2000).

SECTION 4
RESEARCH NEEDS

4.1 RESULTS OF SURVEY AND LITERATURE REVIEW

An informal survey of researchers and a review of the literature indicated the following would be fruitful areas for future research:

- Interdisciplinary and cumulative studies
- Town-level socioeconomic data analysis
- Improved benefit measurement and targeting
- Targeting for re-enrollment
- Wildlife benefits
- Carbon sequestration

Interdisciplinary and Cumulative Studies

CRP is a multi-objective program. Interdisciplinary analysis has begun in recent years, particularly at the watershed level. More work needs to be done in this area. As one researcher stated, "otherwise, each and every scientist will come up with their own limited index [of water quality, soil productivity and wildlife habitat] that can be added to the thousands already available in the journals." Interdisciplinary research is predicated on access to digitized information that is compatibly scaled. Cumulative research incorporates the practices of other conservation, forestry, and water quality protection programs that are concurrently impacting the land, water, and air media.

Town-level Socioeconomic Data Analysis

Many significant impacts may not be captured when aggregated to the county level. However, CRP data is not readily available to researchers at the township level. Both Yang et al (1999) and Rickerl et al. (1999) incorporate CRP tract maps and GIS data at a level in which township-wide impacts could be assessed. If Census data maps were overlain on this data, one could study some of the social impacts of CRP on a sub-county level. However, digitizing CRP tract maps on a national scale would be a huge undertaking, and would likely take several years and committed funding. If the USDA were to make this information available or facilitate its development through the funding of state-level analyses, the CRP program could become more efficient. A linking of the CRP practice and enrollment data with the demographics of the area would allow social scientists to assess the social impacts of CRP enrollment on a township-wide basis. For instance, economic impact studies could look at the differences in multiplier effects and economic diversification for different land use practices. How much of a dollar of sales from the sale of commodity crops for export is used for new investments, versus a dollar of sales from recreation-related visitor spending?

Improved Benefit Measurement and Targeting

There are benefits of CRP that have not been quantified and/or monetized. These include carbon sequestration, big game hunting, threatened and endangered species protection, and landscape amenities. Estimating their values could be used to improve the weighting of the EBI factor scores. POLYSIS, an integrated economic, hydrologic, and GIS model that was used to analyze the 1996 Act, could be updated. The model could forecast national re-enrollment based on profitability, other program payments, exports and net farm income. The characteristics of land forecast for enrollment could be input into benefit valuation functions to determine which criteria would maximize environmental benefits on a national level. Based on the contribution of each category of benefits to total benefits (e.g. the contribution of fishing recreation to total benefits), weights could be assigned to each EBI factor score.

If a regional or state level ranking plan is favored over a national one, the watershed analysis programs being developed at the University of Illinois and South Dakota State University could be adopted to target land for enrollment. Benefit transfer functions could be used in a similar manner, and weights assigned to each factor score.

There are soil characteristics, other than erodibility, that could influence the success of a practice and the benefits generated. Any ranking system should incorporate soil characteristics in addition to erodibility. Soil types and production systems could be more effectively targeted to address the national water quality protection strategy.

Targeting for Re-enrollment

In targeting land for re-enrollment, more consideration should be given to the cumulative effect of enrolling a parcel, even if individually a parcel would not rank high. In other words, the EBI should incorporate more of the marginal benefit a parcel could add to attaining environmental goals in an area. The cumulative impact of CRP with other soil conservation, wildlife habitat improvements, and water quality improvement programs should also be examined. Which program(s) is most cost effective in obtaining these goals, WHIP, EQIP, CRP, CREP, WRP, critical habitat designation, impaired waterways, state and local protection programs, et cetera? Are there indices that could be developed for each of these programs that would be aggregated to represent the cumulative effects on a watershed, ecosystem, or community of having a specific mix of land enrolled in each of these programs? Use of GIS and remote sensing may be helpful in evaluating, monitoring and targeting land for (re)enrollment.

Wildlife Benefits

Wildlife benefits have been the most difficult to measure. To do this effectively, CRP wildlife objectives should be defined at the regional, state, and local levels. The duration and size of wildlife benefits depends on monitoring. There is a need to study the effectiveness of evaluation protocols in maintaining and measuring wildlife benefits. Research on the effects of maintenance practices, disturbances, and haying/grazing on an ecosystem scale would help establish these evaluation protocols. Further investigations of species habitat requirements in relation to planting, management, and the spatial configuration of CRP would also be useful.

Wildlife habitat enhancement benefits have primarily been measured through the success of game bird hunting. Game bird nesting and brood-rearing habitat has been the indicator species for the 'true ecological' success of CRP. The CRP also benefits most species of nongame birds, which ought to be studied as they might be better indicator species. For a more targeted conservation effort, the provision of technical assistance from state and federal fish and wildlife agencies should be investigated. The value of threatened and endangered species preservation and habitat protection could be investigated using non-market valuation techniques.

Carbon Sequestration

Over the past few years, carbon sequestration through agricultural systems has been seriously considered within the context of the CRP. Techniques to value the benefits of carbon sinks have only recently begun to appear in the literature. More work should be done to analyze the cumulative effects of carbon sequestration through CRP, other conservation programs and land use practices, and terrestrial systems, and to improve monitoring protocols.

4.2 CONCLUSION

CRP was one of several programs adopted in the 1985 Farm Bill to address soil productivity through erosion control. The means to do this are through conservation practices on producing land, through programs such as conservation compliance, sodbuster and EQIP, and on non-producing lands through CRP, WRP and WHIP. The original goals of CRP, the protection of soil productivity through erosion control, have largely been met. The program's goals have expanded over time to include and address other environmental issues resulting from agricultural production on highly erodible land. The success of these programs cannot be measured solely on their own. The cumulative effects must be examined with consideration of the impacts from other programs operated by the federal, state, and local governments concerning non-point source pollution, protection of threatened and endangered species, and land protection.

Water, soil and wildlife do not confine themselves to political boundaries. Much of the research done on the CRP in the first decade after its passage was done using data collected within political boundaries. In the past five or so years, there has been a shifting focus to watershed, ecosystem, and community wide analyses. The difficulty in doing this type of analysis is that much of the data collected by FSA and NRCS are either a) incompatible or not on the same scale, or b) not collected at anything but the county level. In addition to changes to data collection and management, improved practice monitoring, whether by federal or state agencies, would aid researchers in cataloguing the actual benefits. This monitoring would also strengthen the cross-compliance link that is supposed to exist between commodity support and CRP.

Regional management or oversight of CRP may be the next step in establishing a more complete national conservation initiative. By managing CRP at a regional scale, water management and habitat fragmentation could be resolved at the watershed and habitat level. This would also foster cooperation during droughts, joint research ventures, and partnerships among states within a region targeted at regional conservation issues. Regional environmental benefit indices would better target environmental problems specific to a region's agriculture.

SECTION 5
TABULATED LITERATURE REVIEWED

The following presents a brief overview of research papers, articles, and reports relevant to the Conservation Reserve Program (CRP). Since this report only presents sweeping overviews of the work cited, readers are urged to obtain and review items that appear to be useful, so they may obtain a more complete understanding of the methods, results, and discussions.

Author(s)	Year	Source	Title	Focus	Program/ Scope
Allen, A. W.	Accessed 3/12/2002	Website, http://www.npwrc.usgs.gov/resource/literatr/crpbib/crpbib.htm	Northern Prairie Science Center Conservation Reserve Bibliography	Bibliography of documents relating to effects of CRP on wildlife.	CRP/National
Allen, A.W.	1993	In, Proceedings of the Great Plains Agricultural Annual meeting. June 2-4, 1993: 41-88	Wildlife habitat criteria in relation to future use of CRP lands	Identified strengths and weaknesses of CRP as its development and management effects wildlife habitat.	CRP/Regional, Local (Great Plains)
Allen, A.W.	1994a	U.S. Fish and Wildlife Service Federal Aid Report, National Biological Survey, National Ecology Research Center, Fort Collins, CO	Regional and state perspectives on Conservation Reserve Program (CRP)	Literature reviewed of information furnished by state and federal biologists on regional effects of CRP on wildlife in agricultural ecosystems.	CRP/National, Regional, State (Various regions and states throughout the U.S.)
Allen, A.W.	1994b	Land and Water: Magazine of Natural Resources and Restoration, 38: 23-25	Wildlife benefits of the Conservation Reserve Program: A national perspective.	Provided a synopsis of the wildlife benefits of CRP and discussed how the pattern of CRP land distribution within a watershed would influence wildlife.	CRP/National
Allen, A.W.	1994c	U.S. Fish and Wildlife Service Federal Aid Report, National Biological Survey, National Ecology Research Center, Fort Collins, CO	Conservation Reserve Program (CRP) contributions to avian habitat.	Discussed characteristics of CRP contracts with greatest potential benefits, landscape planning, and management recommendations.	CRP/National
Allen, A.W., B.S. Cade, and M.W. Vandever	2001	Journal of Soil and Water Conservation, 56(2): 120-125	Effects of emergency haying on vegetative characteristics within selected conservation reserve program fields in the northern Great Plains	Study compared vegetative characteristics of undisturbed and hayed CRP fields to determine if emergency haying would affect long-term vegetative growth/height/density and percent cover of live grass vs. forb cover.	CRP/Regional, State (Great Plains) (ND, SD)

Author(s)	Year	Source	Title	Focus	Program/ Scope
Amosson, S. H., J. Smith, J. Outlaw, and E.G. Smith	1997	Texas Agricultural Extension Service	The CRP Decision Process	Outlined the decision process a landowner must making in deciding to enroll or re-enroll land in CRP.	CRP/State (TX)
Angermeier, P. L. and J. R. Karr.	1994	Bioscience, 44: 690-697	Biological integrity versus biological diversity as policy directives	Examined the ideas of biological integrity and diversity as they pertained to human-generated landscapes, such as agriculture, and discussed the need for effective policy to create a complete conservation protection plan.	Supporting Science
Applied Research Systems, Inc.	1996	Prepared for Natural Resource Conservation Service, December 1996	Qualitative Evaluation of the Continuous Sign-Up Program: Results of Five Focus Groups	Presented the results of five focus groups comprised of farmers to a promotional campaign for buffer strips and continuous CRP.	CRP-Continuous/National
Babcock, B. A., P.G. Lakshminarayan, J. Wu, and D. Zilberman	1996	American Journal of Agricultural Economics, 78: 961-971	The Economics of a Public Fund for Environmental Amenities: A Study of CRP Contracts	Developed a model of CRP enrollment using three maximization targeting schemes: environmental benefits, acreage enrolled and benefits relative to cost, and examined the amount and distribution of water and wind erosion, surface water quality and wildlife habitat	CRP/National
Baer, S.G., C.W. Rice, and J.M. Blair	2000	Journal of Soil and Water Conservation, 55 (2): 142-146	Assessment of soil quality in fields with short and long term enrollment in the CRP	Reviewed soil quality in various areas where CRP practices have been implemented to target soil quality/erosion.	CRP

Author(s)	Year	Source	Title	Focus	Program/ Scope
Baker, B.	2000	Bioscience, 50: 400	Farm Bill environmental program may threaten native prairie habitat	Discussed the potential detrimental consequences of CRP due to extensive use of crested wheatgrass and the failure of USDA conservation to prohibit sobbusting.	CRP/Regional (Northwest)
Baker, J.R., G.A. Baumgardner, D.P. Turner, and J.J. Lee	1995	Journal of Biogeography, 22: 741-743	Potential carbon benefits of Conservation Reserve Program in the United States	Discussed potential National benefits of carbon sequestration related to CRP and associated practices.	CRP/National
Bangsund, D.A., C.R. Gustafson, F.L Leistritz, W.R. Fisher, and D.G. Aakre	1994	Department of Agricultural Economics and Extension Agricultural Economics, Agricultural Experiment Station, North Dakota State University, ND, AE 940006 , June 1994	Economic Impact of Terminating the Conservation Reserve Program in North Dakota	Assessed the direct and indirect economic impacts, by sector, of CRP termination.	CRP/State (ND)
Barbarika, A.	2001	USDA, FSA, Economic and Policy Analysis Staff, November 2001	Conservation Reserve Program: Program Summary and Enrollment statistics as of August 2001	Comprehensive compendium of program history, enrollment and practices data, and EBI sub factor scores.	CRP, CREP/National
Barker, J.R., G.A. Baumgarder, D.P. Turner, and J.J. Lee	1996	Journal of Soil and Water Conservation, 51(4): 340-346.	Carbon dynamics of the Conservation and Wetland Reserve Programs	Conservation and Wetland Reserve Program data was analyzed to quantify carbon dynamics of cropland converted to grass and forestland.	CRP/National
Bartlett, E.T.	1987	In, Impacts of the Conservation Reserve Program in the Great Plains, Symposium Proceedings, September 16-18, USDA, FS, Rocky Mountain Forest and Range Station, Fort Collins, CO, General Technical Report RM-158	Social and Economic Impacts of the Conservation Reserve Program	Discussed the short-term economic impacts of the CRP and the uncertainty of future adverse impacts.	CRP/National

Author(s)	Year	Source	Title	Focus	Program/ Scope
Bastos, G.S. and E. Lichtenberg	2001	Land Economics, 77: 533-547.	Priorities in Cost Sharing for Soil and Water Conservation: A Revealed Preference Study	Examined the consistency of non-CRP cost share programs in meeting environmental priorities.	CRP/National
Berner, A.H.	1994	In, When Conservation Reserve Program contracts expire: The policy options, Soil and Water Conservation Society, Ankeny, IA	Wildlife and federal cropland retirement programs.	Reviewed studies of wildlife responses to cropland retirement programs from 1956 to 1984 and discussed the future of cropland retirement programs.	CRP
Berthelsen, P.S.	1989	M.S. Thesis, Texas Tech University, Lubbock, TX	Value of the conservation reserve program to birds in the Texas southern high plains	Examined what habitat type would provide the greatest potential benefit of the CRP to avian wildlife species in the Texas southern high plains.	CRP/State (TX)
Berthelsen, P.S. and L.M. Smith	1995	Journal of Soil and Water Conservation, 95: 672-675	Nongame bird nesting on CRP lands in the Texas southern High Plains	Determined nongame avian species composition, nest success, and nest density in CRP fields planted with the three most common grass mixtures.	CRP/State (TX)
Best. L. B., H. Campa, III, K.E. Kemp, R.J. Robel, M.R. Ryan, J.A. Savidge, H.P. Weeks, Jr. and S.R. Winterstein	1997	Wildlife Society Bulletin, 25 (4): 864-877	Bird abundance and nesting in CRP fields and cropland in the Midwest: a regional approach	Compared abundance and nesting success of various avian species in rowcrop and CRP fields between 1991-1996.	CRP/Regional, State (Midwest) (IN, KS, MO, MI, NE, LA)
Bills, N. and D. Force	1989a	Journal of Soil and Water Conservation, 44(5), September/October 1989: 512-516	Participation in the Conservation Reserve Program: Implications of the New York Experience	Modeled CRP participation decisions of farmers and non-farming landowners.	CRP/State (NY)

Author(s)	Year	Source	Title	Focus	Program/ Scope
Bills, N. and D. Force	1989b	Policy Issues in Rural Land Use, Department of Agricultural Economics and Cornell Cooperative Extension, 2(2)	The Conservation Reserve Program: Factors Affecting Participation in New York	Examined the demographics, enrollment motivations, and intentions of CRP enrollees at contract expiration.	CRP/Local (NY)
Bock, C.E., V.A. Sabb, T.D. Rich, and D.S. Dobkin	1993	In, Status and management of neotropical migratory birds: 263 – 309	Effects of livestock grazing on neotropical migratory landbirds in western North America	Examined the idea that moderate haying/grazing of CRP coupled with livestock enclosures on public land could enhance the value of public rangelands for wildlife.	CRP/Regional
Boettcher, J.F. and T.B. Bragg	1989	Proceedings of 11th North American Prairie Conference	Tallgrass prairie remnants of eastern Nebraska	Presented the ideas that seasonal mowing may influence species composition.	Supporting Science
Boyles, S.L., B.W. Stoll, and T.L. Dobbles	2001	Journal of Sustainable Agriculture, 18(4): 113-120	The Use of Conservation Reserve Program Land for Grazing Cattle	Monitored the performance and economics of cattle grazed on CRP land and determined if intensive grazing is compactable with water quality.	CRP/State, Local (OH) (Indian Lake Watershed)
Brady, S.	2000	The Wildlife Management Institute's Farm Bill Workshop-Held July 8-10, 2000 at Holiday Inn Capital & Rayburn House Office Building in Washington D.C.	Wildlife Response to the Conservation Reserve Program	The report documented wildlife responses to CRP by summarizing research projects and field studies undertaken.	CRP/National
Brennan, L.A	1991	Wildlife Society Bulletin, 19 (4): 544-555	How can we reverse the northern bobwhite population decline	Examined and addressed the possible causes and effects associated with the northern bobwhite population decline since the 1970's.	Supporting Science

Author(s)	Year	Source	Title	Focus	Program/ Scope
Burger, L.W., Jr., E. Kurzejeski, T.V. Daily, and M.R. Ryan	1989	Transactions of the North American Wildlife and Natural Resources Conference, 55: 74-83	Structural characteristics of vegetation in conservation reserve program fields in northern Missouri and their suitability as bobwhite habitat	Studied vegetative characteristics on CRP lands in northern Missouri concerning the value of the land as winter, nesting, and brood-rearing cover for bobwhite quail.	CRP/State (MO)
Cable, T.T.	1991	In, Wildlife and habitats in managed landscapes, 35-55	Windbreaks, wildlife, and hunters	Addressed the role of windbreaks and shelterbelts in the agricultural landscape.	Supporting Science
Carmichael, D.B.	1997	Wildlife Society Bulletin, 25(4): 773-775	The Conservation Reserve Program and wildlife habitat in the southeastern United States	CRP associated wildlife benefits were compared among southeastern states, the Great Plains, and the Midwest with regards to pine plantations and tall fescue.	CRP/Regional (Southeast)
Christian, J.M. and S.C. Wilson	1999	Ecology, 80 (7): 2397-2407	Long-term ecosystem impacts of an introduced grass in the northern great plains	Evaluated five grass stands in an undisturbed prairie (successional prairie-abandoned for around 50 years) and abandoned fields planted with crested wheatgrass looking at species diversity and soil Carbon makeup.	Supporting Science
Claassen, R. and R.D. Horan	2000	Agricultural Outlook, June-July 2000, USDA, ERS, 15-18	Environmental Payment to Farmers: Issues of Program Design	Discussed issues and implementation of a farmer payment system based on a comprehensive measurement of environmental benefits with tradeoffs from agricultural practices under numerous USDA programs.	CRP/National

Author(s)	Year	Source	Title	Focus	Program/ Scope
Claassen, R., L. Hansen, M. Peters, V. Breneman, M. Weingerg, A. Catteneo, P. Feather, D. Gadsby, D. Hellerstein, J. Hopkins, P. Johnston, M. Morehart, and M. Smith	2001	Agricultural Economic Report No. 794, USDA, FSA	Agri-Environmental Policy at the Crossroads: Guideposts on a Changing Landscape	Discussed development and implementation of a farmer payment system based on a comprehensive measurement of environmental benefits and tradeoffs from agricultural practices endorsed under numerous USDA conservation programs.	Supporting Science
Clark, R.T.	2001	Cornhusker Economics, Cooperative Extension/Institute of Agriculture and Natural Resources, March 28, 2001.	The Conservation Reserve Program: Then and Now	Described regional shifts in enrollment with Nebraska with the introduction of the EBI in 1990.	CRP/State/ASD (NE)
Committee on Agriculture, House of Representatives	1999	Website, http://commdocs.house.gov/committees/ag/hag10630.000/hag10630_0.htm	Hearing before the subcommittee on general farm commodities, resource conservation, and credit of the Committee on Agriculture, House of Representatives, One-Hundred Sixth Congress, First Session on H.R. 408, July 22, 1999	Transcript reviewed the hearing about the USDA's Administration of the Conservation Reserve Program.	CRP

Author(s)	Year	Source	Title	Focus	Program/ Scope
Cooper, J. C. and C.T. Osborn	1998	American Journal of Agricultural Economics, 80: 184-194	The Effect of Rental Rates on the Extension of the Conservation Reserve Program Contracts	A contingent valuation survey was used to examine farmers' CRP renewal incentives given two economic scenarios: 1)renewal at varying rental rates with no haying or grazing permitted and 2)renewal at varying rental rates with regulated haying and grazing permitted.	CRP/National
Council for Agricultural Science and Technology	1990	Task Force Report Number 117, Ames, IA	Ecological impacts of federal Conservation and Cropland Reduction Programs	Summarized history of agricultural overproduction in the U.S. and recommended CRP changes related to overproduction.	CRP/National
Dale, B.C., P.A. Martin, and P.S. Taylor	1997	Wildlife Society Bulletin, 25 (3): 616-626	Effects of hay management on grassland songbirds in Saskatchewan	Evaluated impacts of hay management on endemic grassland birds.	Supporting Science
De La Torre Ugarte, D.G., D.E. Ray, R.L. White, and M.R. Dicks	1995	Part of The 1995 Farm Bill: A Series of Alternative Policy Analyses, published by the Agricultural Policy Analysis Center, University of Tennessee and Great Plains Agricultural Policy Center, Oklahoma State University.	The Conservation Reserve Program	An economic analysis of CRP used in the development of the FAIR bill that assumed the continuation of pre-1996 farm programs under three scenarios: program termination, program extension, and program extension with reduced acreage cap.	CRP/National, Regional

Author(s)	Year	Source	Title	Focus	Program/ Scope
Delisle, J.M. and J.A. Savidge	1997	Journal of Wildlife Management, 61 (2): 318-325	Avian use and vegetation characteristics of Conservation Reserve Program Fields	Compared avian use of different vegetation types CP1 (cool-season grasses & legumes) vs. CP2 (warm-season, native grasses) in southeastern Nebraska.	CRP/State (NE)
Dicks, M.R.	1996	In, Proceedings of the American Society of Farm Managers and Rural Appraisers' Annual Meeting, October 21-28, 1996, Dallas TX	The Impacts of CRP in the Future	Analyzed the economic, environmental and land use interactions of CRP expiration with reduced supply management under FAIR.	CRP/State (OK)
Diebel, P. L., L.L. Janssen, and K. Smith	1996	NC-214 Committee Report	Economic and Environmental Implications of Expiring Conservation Reserve Program Contracts	Discussed policy implications of a new 1996 farm bill, using state level studies of environmental benefits and a demographic analysis of enrollees.	CRP/National, State (NC)
Dodson, C., R. McElroy, F. Gale, K. Hanson, and C. Carlin	1994	Agricultural Outlook, September 1994, USDA, ERS	Gauging Economic Impacts as CRP Contracts Expire	The results of a survey of CRP enrollees were used to analyze the economic impacts of the expiration of all CRP contracts between 1995 and 2003.	CRP/National, Regional
Douglas, A. J. and R.L. Johnson	2001	U.S. Geological Survey, Biological Resources Division, Midcontinent Ecological Science Center	Nonmarket Economic Benefits Provided by Increased Recreational Fishing From Conservation Reserve Program (CRP) Related Water Quality Improvement	Estimated the nonmarket angling benefits of CRP-related water quality improvements.	CRP/National, Local (Klamath Basin)

Author(s)	Year	Source	Title	Focus	Program/ Scope
Dunn, C.P., F. Stearns, G.R. Guntenspergen, and D.M. Sharpe	1993	Conservation Biology, 7 (1) :132-139	Ecological benefits of the Conservation Reserve Program	Presented significant ecological benefits of CRP.	CRP/National
Environmental Defense Fund	Accessed: 02/15/2002	Website, http://www.fb-net.org/CREP-EDF.htm	Suggestions to States Interested in Developing Conservation Reserve Enhancement Programs	Offered past state's suggestions on the issues an applying state would want to address, if they chose to pursue a CREP program of their own.	CREP/State
Ervin, D.E. and J.W. Mill	1985	American Journal of Agricultural Economics, 67(5): 938-042	Agricultural Land Markets and Soil Erosion: Policy Relevance and Conceptual Issues	Modeled the failure of farmland market to incorporate the social costs of off-site erosion.	Supporting Science
Farris, A.L. and S.H. Cole	1981	Transactions of the North American Wildlife and Natural Resources Conference, 46: 130-136	Strategies and goals for wildlife habitat restoration on agricultural lands	Discussed the decline in farmland wildlife habitat and presented means of correcting the declines.	Supporting Science
Feather, P., D. Hellerstein, and L. Hansen	1999	Agricultural Report No. 778, USDA, ERS	Economic Valuation of Environmental Benefits and the Targeting of Conservation Programs: The Case of the CRP	Analyzed the impacts on water quality and wildlife from alternative specifications of the EBI using nonmarket valuation models.	CRP/National, Regional
Feather, P., and D. Hellerstein	1997	American Journal of Agricultural Economics, 79: 151-162	Calibrating Benefit Function Transfer to Assess the Conservation Reserve Program	A benefit transfer function was calibrated to corrected for bias and used to estimate the water-based recreation benefits of CRP.	CRP/National, State (IN, NE, PA, WA)

Author(s)	Year	Source	Title	Focus	Program/ Scope
Flora, J.L. and C.B. Flora	1987	In, Impacts of the Conservation Reserve Program in the Great Plains, Symposium Proceedings, September 16-18, 1987, USDA, FS, Rocky Mountain Forest and Range Station, Fort Collins, CO, General Technical Report RM-158	The Effects of Different Production Systems, Technology Mixes, and Farming Practices on Farm Size and Communities: Implications for the Conservation Reserve Program	Forecasted economic impacts of CRP enrollment on farming-dependent counties in the Great Plains.	CRP/Regional/State (Great Plains) (KS)
Frawley, B.J.	1989	M.S. Thesis, Iowa State University, Ames, IA	The dynamics of nongame bird breeding ecology in Iowa alfalfa fields	Nesting, abundance, and density of nongame birds in Iowa alfalfa fields were addressed and linked to CRP.	CRP/State (IA)
Gilley, J.E., B.D. Patton , P.E. Nyren, and J.R. Simanton	1996	Applied Engineering in Agriculture, 12 (6): 681-684	Grazing and haying effects on runoff and erosion from a former conservation reserve program site	Grazing and haying effects on runoff and erosion for a former CRP site were examined.	CRP/State, Local (Streeter, ND)
Gleason R.A. and N.H. Euliss	1998	In, Water for Agriculture and Wildlife and the Environment Win-Win Opportunities, 107-114	Sedimentation of Prairie Pothole Wetlands: The Need for Integrated Research by Agricultural and Wildlife Interests	Examined the influences of sedimentation on wildlife values in wetlands within the Prairie Pothole Region.	CRP/Regional (Prairie Pothole)

Author(s)	Year	Source	Title	Focus	Program/ Scope
Goodwin, B. K. and J. Deal	2001	Selected Paper presented at the 2001 Annual AAEA Meetings, Chicago, May 15, 2001.	The Federal Crop Insurance Program: An Empirical Analysis of Regional Differences in Acreage Response and Participation	A structural model of crop acreage response to crop insurance programs was developed, which included CRP enrollment as a predictor variable.	CRP/National
Goodwin, B. K. and V.H. Smith	2000	Unpublished manuscript, August 10, 2001	An Ex-Post Evaluation of the Conservation Reserve, Federal Crop Insurance, and Other Government Programs: Program Participation and Soil Erosion	Examined the impact of CRP, crop insurance and disaster relief programs on soil erosion.	CRP/National
Gould, J.	1991	M.S. Thesis, South Dakota State University, Brookings, SD	Seasonal use of Conservation Reserve Program fields by white-tailed deer in eastern South Dakota	CRP land cover and maintenance practices, where white-tailed deer populations nested in eastern South Dakota, were examined.	CRP/State (SD)
Granfors, D.A., K.E. Church, and L.M. Smith	1996	Journal of Field Ornithology, 67: 222-235	Eastern meadowlark nesting in rangelands and Conservation reserve Program fields in Kansas	Compared microhabitat, nest selection and nest success of the Eastern meadowlark on rangeland and CRP land.	CRP/State (KS)
Griffin, S.L.	1991	M.S. thesis, South Dakota State University, Brookings, SD	Pronghorn use of agricultural land in northwestern	Studied the seasonal use of CRP grasslands by pronghorns.	CRP/State (SD)

Author(s)	Year	Source	Title	Focus	Program/ Scope
			South Dakota		
Gustafson, C.R. and C.L. Hill	1993	Agricultural Economics Report No. 302, Department of Agricultural Economics and Agricultural Experiment Station, North Dakota State University, ND	Future Land Use Decisions of North Dakota Conservation Reserve Program Participants	Identified factors influencing post-CRP expiration land uses.	CRP/State (ND)
Hall, D.L. and M.R. Willig	1994	The Southwestern Naturalist, 39: 1-10	Mammalian species composition, diversity, and succession in Conservation Reserve Program grasslands	Compared the abundance of small mammals and their species diversity between native shortgrass grasslands and CRP fields in the Texas Southern High Plains.	CRP/State (TX)
Hamilton, L. L. and R.A. Levins	1998	Paper presented at the Sixth Joint Conference on Food, Agriculture and the Environment, Minneapolis, MN, 8/31-9/2/98.	Local Economic Impacts of Conservation Reserve Program Enrollments: A Sub-County Analysis	The social impacts of CRP programs more acutely affect sub-county (townships) and are preferred to using county level data.	CRP/State (MN)
Harmon, K.W.	1987	In Impacts of the Conservation Reserve Program in the Great Plains, Symposium Proceedings, September 16-18, 1987, USDA, FS, Rocky Mountain Forest and Range Station, Fort Collins, CO, General Technical Report RM-158	History and Economics of Farm Bill Legislation and the Impacts on Wildlife Management and Policies	Long-term land retirement has greater economic and wildlife benefits than annual set-asides.	CRP/National, State (SD, MN)

Author(s)	Year	Source	Title	Focus	Program/ Scope
Heard, L.P., A.W. Allen, L.B. Best, S.J. Brady, W. Burger, A.J. Lesser, E. Hackett, D.H. Johnson, R.L. Pederson, R.E. Reynolds, C. Rewa, M.R. Ryan, R.T. Molleur, and P. Buck	2000	United States Department of Agriculture, Natural Resources Conservation Service, Wildlife Management Institute, Technical Report, USDA/NRCS/WMI-2000	A comprehensive review of Farm Bill contributions to wildlife conservation, 1985-2000	Provided a comprehensive review of some scientific literature describing wildlife responses to USDA programs establish under Conservation Title of the 1985, 1990, and 1996 amendments.	CREP,CRP-General, CRP-Continuous
Heimlich, R.	2002	United States Department of Agriculture, Economic Research Service, April, 2002, 22-23	The U.S. Experience with Land Retirement for Natural Resource Conservation.	Discussed the history and economic challenges of soil conservation programs in the U.S.	CRP/National
Herkert, J.R.	1994	Natural Area Journal, 14: 128-135	Breeding bird communities of Midwestern prairie fragments: the effects of prescribed burning and habitat area	Compared the effects of habitat area and prescribed burning on breeding bird communities using Midwestern prairie fragments.	Supporting Science
Herkert, J.R.	1998	Wildlife Society Bulletin, 26: 227-231	The influence of the CRP on grasshopper sparrow population trends in the midcontinential United States	Attempted to determine if CRP had a measurable population-level effect on grasshopper sparrows and whether this trend was directly related to CRP acreage in study area.	CRP/Regional (Mid-continental U.S.)

Author(s)	Year	Source	Title	Focus	Program/ Scope
Higgins, K.F., D.E. Nomsen, and W.A. Wentz	1987	In Impacts of the Conservation Reserve Program in the Great Plains, Symposium Proceedings, September 16-18, 1987, USDA, FS, Rocky Mountain Forest and Range Station, Fort Collins, CO, General Technical Report RM-159	The Role of the Conservation Reserve Program in Relation to Wildlife Enhancement, Wetlands and Adjacent Habitats in the Northern Great Plains	Focused on the value of CRP grasslands directly related to wetlands and their associated wildlife (primary migratory birds).	CRP/Regional (Northern Great Plains)
Hines, F., J. Sommer, and M. Petrulis	1991	Agricultural Outlook, September 1991, USDA, ERS	How the CRP Affects Local Economies	IMPLAN was used to estimate the change in income distribution from the replacement of crop sale income with CRP rental payments and a decrease in local agricultural input sales.	CRP/Regional
Hoag, D.	1999	In, Incentives in Soil Conservation: From Theory to Practice, Chapter 12, Published by the World Association of Soil and Water Conservation	Soil Conservation Incentives in the 1985-1996 US Farm Bills	Provided a history of their development and changes made to the programs subsequent to the 1985 Farm Bill	Supporting Science
Hodur, N.M., F.L Leistritz, and D.A. Bangsund	2002	Agribusiness and Applied Economics Report No. 476-S, Department of Agribusiness and Applied Economics, North Dakota State University, ND, April 2002	Local Socioeconomic Impacts of the Conservation Reserve Program	Examined the economic, demographic and public service impacts of cropland retirement and expanded recreational opportunities.	CRP/State (ND)
Huang, W.Y., K. Algozin, D. Ervin, and T. Hickenbotham	1990	Journal of Water and Soil Conservation, 45: 341-346	Using the Conservation Reserve Program to protect groundwater quality	Five policy strategies aimed at retiring 10 million acres of cropland that overlies groundwater vulnerable to pesticides in the CRP were investigated.	CRP/National

Author(s)	Year	Source	Title	Focus	Program/ Scope
Huggins, D.R., D.L. Allan, J.C. Gardner, D.L. Karlen, D.F. Bezdicek, M.J. Rosek, M.J. Alms, M. Flock, B.S. Miller, and M.L. Staben	1997	In, Management of carbon sequestration in soil: 323-334	Enhancing carbon sequestration in CRP managed land	Discussed methods for sequestering carbon from terrestrial ecosystems.	CRP/National
Hughes, J., D. Hoag, and T. Nipp	1995	Special Publication No.19, Council for Agricultural Science and Technology	The Conservation Reserve: A Survey of Research and Interest Groups	Provided a summary of CRP literature and a survey of the preferences of interest groups for CRP policy development.	CRP/National
Igl, L.D. and D.H. Johnson	1999	In P.D. Vickery and J.R. Herkert, eds., Ecology and Conservation of Grassland Birds of the Western Hemisphere, Studies in Avian Biology 19, 178-186	Le Conte's Sparrows Breeding in Conservation reserve Program Fields: Precipitation and Patterns of Population Change	Discussed pattern of population change in Le Conte's Sparrows associated with changes in precipitation and moisture condition.	CRP/Regional (Great Plains)
Janssen, L., L. Venhuizen, and M. Beutler	1997	Selected Papers of the 1997 Annual Meeting, Western Agricultural Economics Association, July 13-16, 1997, Reno/Sparks, Nevada	Economic Impacts of Post-CRP Policy Options in South Dakota	Examined the economic impacts of 3 CRP alternatives in South Dakota: CRP termination, reduced acreage cap, and program continuation.	CRP/State (SD)
Jaroszewski, L., G. Poe, and R.N. Boisvert	2000	Selected paper presented at the Annual Meetings of the American Agricultural Economics Association, Tampa, FL, August 2000	Allocating Land to New York's Conservation Reserve Enhancement Program to Maximize Net Environmental	A programming model allocates acreages across 8 practices and 11 regions so as to maximize net benefits to society.	CREP/State (NY)

Author(s)	Year	Source	Title	Focus	Program/ Scope
			Benefits		
Jewett, G., C.C. Sheaffer, R.D. Moon, N.P. Martin, D.K. Barnes, D.D. Breitbach, and N.R. Jordan	1996a	Journal of Production Agriculture, 9: 528-534	A survey of CRP land in Minnesota: I. Legume and grass persistence	Evaluated vegetation in 151, six to eight-year old CRP fields planted to cool and warm season grasses.	CRP/State (MN)
Jewett, G., C.C. Sheaffer, R.D. Moon, N.P. Martin, D.K. Barnes, D.D. Breitbach, and N.R. Jordan	1996b	Journal of Production Agriculture, 9: 535-542	A survey of CRP land in Minnesota: II. Weeds on CRP land	Evaluated the prevalence of weeds in 151, six to eight-year old CRP fields planted to cool and warm season grasses.	CRP/State (MN)
Johnson J.	2001	Journal of Rural Studies, July, 17(3): 223-232	The Role of the Conservation Reserve Program in Controlling Rural Residential Development.	Modeled the impact of CRP on urban sprawl and rural community sustainability.	CRP/State (MT)
Johnson, D.H. and L.D. Igl	1995	Wilson Bulletin, 107(4): 709-718	Contributions of the Conservation Reserve Program to Populations of Breeding Birds in North Dakota	Estimated the relative importance of the CRP to breeding grassland bird populations.	CRP/State (ND)
Johnson, D.H. and L.D. Igl	2001	Auk, 118(1): 24-34	Area Requirements of Grassland Birds: A Regional Perspective	Examined the influence of fragmentation and isolation of CRP grassland fields on grassland breeding bird populations in the northern Great Plains.	CRP/Regional (Great Plains)

Author(s)	Year	Source	Title	Focus	Program/ Scope
Johnson, D.H. and M.D. Schwartz	1993	Great Plains Research 3(2): 273-295	The Conservation Reserve Program: Habitat for Grassland Birds	Described bird populations on more than 300 CRP fields in the northern Great Plains and related densities of selected species to geographic location, annual effects, conservation practice adopted, and vegetation features.	CRP/Regional, State (MN, ND, SD, MT)
Johnson, J. and Maxwell, B.	2001	Journal of Rural Studies, 17(ER3): 323-332	The Role of the Conservation Reserve Program in Controlling Rural Residential Development.	A land prediction model in Montana showed that an area with CRP was projected to have an average residential land-use growth rate of almost half that of areas without CRP enrollment.	CRP/State (MT)
Johnson, J.B. and R.T. Clark	2001	FB-2001-1, Agricultural and Food Policy Center, Texas A & M University, TX	The Conservation Reserve Program	Discussed three issues related to CRP renewal: 1) use of MARR, 2) use of EBI; and 3) tenant-landlord sharing.	CRP/National
Johnson, J.B. and Zidack, W.E.	1997	Departmental Special Report #20, Department of Agricultural Economics and Economics, Montana State University, Billings, MT, February 1997	Coming out of CRP.	Surveyed CRP enrollees and found out that 94% of the land would be returned to crop production, haying and grazing.	CRP/State (MT)
Jolly, R.W., A. Vontalge, B. Peterson, and R. Spraque	1995	Pm-1619, Southern Iowa Forage and Livestock Committee and Iowa State University, Agriculture and Home Economics Experiment Station, University Extension, May 1995	When the CRP Ends: A Look at Production Alternatives for Highly Erodible Land in Southern Iowa	Predicted the possible uses for land in Southern Iowa if CRP were ended, based on productivity and ownership characteristics.	CRP/State (IA)

Author(s)	Year	Source	Title	Focus	Program/ Scope
Kantrud, H.A.	1993	Journal of Soil and Water Conservation, 48 (3): 238-242	Duck nesting success on Conservation Reserve Program land in the prairie pothole region	Studied duck nesting success in Waterfowl Production Areas and CRP tracts.	CRP/Regional (Prairie Pothole)
Kantrud, H.A. and R.L. Kologiski	1982	Wildlife Research Report 15	Effects of soils and grazing on breeding birds of uncultivated upland grasslands of northern great plains	Discussed the use of livestock grazing on lands set aside for wildlife and how it can be used as a management measure to increase populations of game species and thus increase plant/animal species diversity.	Supporting Science
Kantrud, H.A., R.R. Koford, D.H. Johnson, and M.D. Schwartz	1993	North Dakota Outdoors, 56(2): 14-17	The Conservation Reserve Program - Good for birds of many feathers	Examined avian species' use and population trends on CRP land in North Dakota.	CRP/State (ND)
Karlen, D.L., J.C. Gardner, and M.J. Rosek	1998	Journal of Production Agriculture, (11): 56-60	A soil quality framework for evaluating the impact of CRP	Looked at how soil quality assessments might be used to evaluate the impact of public policies, such as CRP, by presenting a structured approach for interpreting soil quality indicator data & introducing a conceptual framework used to link the various scales of evaluation, including those needed for assessing effectiveness of public polices like CRP.	CRP/National

Author(s)	Year	Source	Title	Focus	Program/ Scope
Karlen, D.L., M.J. Rosek, J.C. Gardner, D.L. Allan, M.J. Alms, D.F. Bezdicek, M. Flock, D.R. Huggins, B.S. Miller , and M.L. Staben	1999	Journal of Soil and Water Conservation, 54 (1): 439-444	Conservation Reserve Program effects on soil quality indicators.	Reviewed soil data from areas in the U.S. for their responses to the CRP and whether the soil quality indicators currently used are an accurate measure of ecosystem responses to CRP.	CRP/Regional, State (IA, MN, ND, WA)
Kigsbury, L., P.L. Diebel, W.G. Boggess, and J. Wu	2002	Draft Working Paper, April 12, 2002	An Economic Analysis of Riparian Landowners' Willingness to Participate in Oregon's Conservation Reserve Enhancement Program	Contingent valuation was used to model willingness to participate in Oregon's CREP as a function of financial incentives (opportunity costs, future expectations and preferences) and socioeconomic variables.	CREP/State (OR)
King, J.W. and J.A. Savidge	1995	Wildlife Society Bulletin, 23(3) : 377-385	Effects of the Conservation Reserve Program on wildlife in southeast Nebraska	Examined bird numbers and species richness relative to vegetative cover type and diversity in southeast Nebraska.	CRP/State (NE)
Kingsbury, L.	1999	M.S. Thesis, Oregon State University, Corvallis, OR	Oregon's Conservation Reserve Enhancement Program: Likely Participation and Recommendations for Implementation	Assessed the willingness of private riparian landowners to participate in Oregon's CREP under various contract provisions.	CREP/State (OR)

Author(s)	Year	Source	Title	Focus	Program/ Scope
Kingsbury, L. and W. Boggess	1999	Selected Paper for the Annual Meeting of the American Agricultural Economics Association, August 1999	An Economic Analysis of Riparian Landowners' Willingness to Participate in Oregon's Conservation Reserve Enhancement Program	A survey was used to model the probability of participation in Oregon's CREP as a function of the economic incentives and expectations, environmental regulation and preferences, personal characteristics; and prior knowledge about USDA programs.	CRP/State (OR)
Kingsbury, L., P.L. Diebel, W.G. Boggess, and J. Wu	2002	Working Paper No. AREc 02-101, Agricultural and Resource Economics Department, Oregon State University, Corvallis, OR	An Economic Analysis of Riparian Landowners' Willingness to Participate in Oregon's Conservation Reserve Enhancement Program	Focus unavailable for this document	CREP
Klute, D.S.	1994	M.S. Thesis, Kansas State University, Manhattan, KS	Avian community structure, reproductive success, vegetative structure, and food availability in burned CRP Fields and grazed pastures in northeastern Kansas	Compared avian community structure and reproductive success, food availability, and vegetative structure in CRP grasslands in northern Kansas that were grazed and burned.	CRP/State (KS)

Author(s)	Year	Source	Title	Focus	Program/ Scope
Knopf, F.L.	1986	Wildlife Society Bulletin, 14: 132-142	Changing landscapes and the cosmopolitanism of eastern Colorado avifauna	Addressed the link between current conservation theory and decisions for local management and the need for regional management plans.	Supporting Science
Koford, R.R.	1999	In, Studies in Avian Biology, 19:187-195	Density and fledgling success of grassland birds in Conservation Reserve Program fields in North Dakota and west-central Minnesota	Studied how CRP field habitat influences grassland bird density and fledgling success.	CRP/State (MN,ND)
Koford, R.R. and L.B. Best	1996	In F.R. Thompson, III, ed., Management of Midwestern landscapes for the conservation of neotropical migratory birds, United States Department of Agriculture, Forest Service, North Central Exp. Station, General Technical Report NC-781: 86-88	Management of agricultural landscapes for the conservation of neotropical migratory birds	Discussed management strategies for the management of avian habitat in agricultural landscapes.	Supporting Science
Kurtz, W. B., R.J. Alig, and T. J. Mills	1980	Journal of Forestry, 78(5): 273-276	Retention and Condition of Agricultural Conservation Program Conifer Plantings	Evaluated the long-term effectiveness of a government sponsored tree planting program, the ACP, by examining retention rates and stand management.	CRP/State (MO, PA, SC, MS, WI)

Author(s)	Year	Source	Title	Focus	Program/ Scope
Kurtz, W. B., T. A. Noweg, R. J. Moulton, and R.J. Alig	1996	In, Proceedings: Symposium on Nonindustrial Private Forests: Learning from the Past, Prospects for the Future, February 18-20, 1996, Sheraton Washington Hotel, Washington DC, 348-356	Retention, Condition and Land-use Aspects of Tree Plantings Under Federal Forest Programs	Used retention rates from Soil Bank Program, ACP and FIP to forecast what might happen with the pending expiration of the CRP program in 1996.	CRP/Regional
Kurzejeski, E.W.	1996	Missouri Department of Conservation, Federal Aid Project, Final Report: W-31-R-05	Vegetation structure and avian species composition in diverted farmland	Compared vegetative characteristic's influence on avian composition, abundance, and productivity on different grass and rowcrop fields.	CRP/State (MS)
Langemeier, M.R., R.D. Jones, and P.D. Ohlenbusch	1996	In, SRM Abstracts, Paper Presented at the 49th Annual Meeting of the Society for Range Management, 49, February 1996: 43-44.; 53-54	Economic Analysis of Haying and Grazing Kansas CRP Land; Determining the Effect of Prior Management Practices on Grazing CRP Land	Assessed the economic feasibility of mowing, prescribed burning and haying on expiring CRP land.	CRP/State (KS)
Lant, C.L.	1991	Environmental Management, 15(4): 507-518	Potential of the Conservation Reserve Program to control agricultural surface water pollution	Estimated potential enrollment of streamside and floodplain croplands in a ten year land retirement program in order to gauge the potential of the CRP as a water quality improvement policy.	CRP/State (IL)

Author(s)	Year	Source	Title	Focus	Program/ Scope
Lant, C.L., S.E. Kraft, and K.R. Gillman	1995	Journal of Soil and Water Conservation, 50 (2): 201-205	The 1990 Farm Bill and Water Quality in Corn Belt Watersheds: Conserving Remaining Wetlands and Restoring Farmed Wetlands	Contingent valuation surveys were conducted in 10 counties to estimate potential enrollment of farmed wetlands in the CRP and WRP.	CRP/Regional (Corn Belt)
Leddy, K.L., K.F. Higgens, and D.E. Naugle	1999	Wilson Bulletin, 111: 100-104	Effects of wind turbines on upland nesting birds in Conservation Reserve Program grasslands	Studied the effects on upland nesting birds based on wind turbine placement on cropland vs. on CRP land.	CRP/Regional (Midwest)
Leistritz, F. L.	1998	Paper presented at Symposium on Challenges and Solutions in Using Input-Output (I-O) Analysis for Conservation Programs and Project, American Agricultural Economics Association 1998 Conference, August 2-5, Salt Lake City, UT	Using Input-Output (I-O) Analysis in Evaluating Conservation Programs and Projects: Lessons Learned from Evaluation of the Conservation Reserve Program (CRP)	Examined the economic impacts of the reduction in use of local agricultural inputs under CRP enrollment.	CRP/State (ND)
Lichtenberg, E.	2001	Department of Agricultural and Resource Economics, University of Maryland, College Park, MD	Adoption of Soil Conservation Practices: A Revealed Preference Approach	A revealed preference survey was used to understand the adoption of 11 conservation practices, the responsiveness of adoption to cost sharing, and complementarity of the practices.	Supporting Science

Author(s)	Year	Source	Title	Focus	Program/ Scope
Londo, A.J., T.A. Traugott, S.G. Dicke, and S.D. Roberts	2001	Forest and Wildlife Research Center, Mississippi State University, Publication Number FO 182	How to determine when your Conservation Reserve Program (CRP) pine plantation is ready to thin	Developed a method to assist landowners/farmers/foresters in deciding when a first thinning of CRP pine plantations should occur.	CRP/State (MO)
Lubben, B.D., Simons, J. Clay, N.L. Bills, N.L. Meyer, and J.L. Novak	2001	Publication No.2001-02, National Public Policy Education Committee, Farm Foundation, September 2001	The 2002 Farm Bill: U.S. Producer Preferences for Agricultural, Food, and Public Policy.	National survey of over 14,000 producers on agricultural policy, which includes sections on conservation and environmental programs.	Supporting Science
Lunch, L. and C. Brown	2000	Journal of Agricultural and Applied Economics, 32(3): 585-596	Landowner Decision Making about Riparian Buffers	Examined landowner's nested decisions to continue farming, to plant a buffer, and the type of buffer to plant.	CREP/State (MD)
Luttschwager, K.A.	1991	M.S. Thesis, South Dakota State University, Brookings, SD	Effects of two haying provisions on duck nesting in Conservation Reserve Program (CRP) fields in South Dakota	Evaluated the effects of emergency haying on duck nesting success in CRP fields.	CRP/State (SD)
Lynch, L. and Tjaden, R.	2000	Fact Sheet 774, Maryland Cooperative Extension,	When a Landowner Adopts a Riparian Buffer – Benefits and Costs.	Detailed costs and benefits of riparian buffer installation.	CRP/CREP/State (MD)
Lynch, L., Hardie, I. and Parker, D.	2002	WP 02-01, Department of Agricultural and Resource Economics, University of Maryland, College Park, MD	Analyzing Agricultural Landowners' Willingness to Install Streamside Buffers	A survey of Maryland landowners examined what level of financial incentives is needed to interest owners in installing buffers.	CREP/State (MD)

Author(s)	Year	Source	Title	Focus	Program/ Scope
Lynne, G.D., Shonkwiler, J.S., and Rola, L.R.	1988	American Journal of Agricultural Economics, February 1988, 70: 12-19	Attitudes and Farmer Conservation Behavior	Developed a behavioral model of soil management decisions by farmers.	Supporting Science
Magleby, R., C. Sandretto, W. Crosswhite, and C.T. Osborn	1995	AIB-718, USDA, ERS	Soil Erosion and Conservation in the United States: An Overview	Discussed soil erosion in the U.S., the evolution of federal and state conservation programs, models used to predict the impact of erosion on soil productivity and water quality, and summarizes the benefits of soil conservation from other studies.	CRP, CREP/ National, Local (10 local case studies)
McCoy, T.D.	1996	M.S. Thesis, University of Missouri, Columbia, MO	Avian abundance, composition, and reproductive success on Conservation Reserve Program fields in northern Missouri	Studied various avian species abundance, composition, and reproductive success in different grassland types (CP1 vs. CP2) in northern Missouri.	CRP/State (MO)
McCoy, T.D., M.R. Ryan, E.W. Kurzejeski, and L.W. Burger, Jr.	1999	Journal of Wildlife Management, 63 (2): 530-538	Conservation Reserve Program: source or sink habitat for grassland birds in Missouri	Studied the estimated fecundity of a few species of grassland birds, nesting in CRP fields.	CRP/State (MO)
Millenbah, K.F.	1993	M.S. Thesis, Michigan State University, East Lansing, MI	The effects of different age classes of fields enrolled in the Conservation Reserve Program in Michigan on avian diversity, density, and	Determined relations between field age and characteristics of avian communities with associated vegetative characteristics in six age class fields.	CRP/State (MI)

Author(s)	Year	Source	Title	Focus	Program/ Scope
			productivity		
Miller, E.J.	1989	M.S. Thesis, Virginia Polytechnic Institute and State University, Blacksburg, VA	Wildlife management on Virginia Conservation Reserve Program land: the farmer's view	Surveyed land owners/farmers to ascertain their views on the CRP and its implementation.	CRP/State (VA)
Miranowski, J.A.	1988	Journal of Soil and Water Conservation, January-February, 32(1): 59-60	Monitoring the Economic Impacts of the Conservation Reserve	Outlined ERS alternative land enrollment targeting schemes, and probable economic impacts of CRP enrollment.	CRP/National
Mitchell, J.E. and G.R. Evans	1987	In Impacts of the Conservation Reserve Program in the Great Plains, Symposium Proceedings, September 16-18, 1987, USDA, FS, Rocky Mountain Forest and Range Station, Fort Collins, CO, General Technical Report RM-158	A Prospectus for Research Needs Created by Passage of the Conservation Reserve Program	Outlined some of the gaps within the current knowledge base available to agricultural policy makers and offered a strategy for filling these knowledge gaps.	CRP/National
Monson, M. and D. Cassidy	1996	In, North Central Extension Industry Soil Fertility Conference	The Conservation Reserve Program: Changes on the Horizon	Demonstrated that most of the environmental benefits anticipated to be lost upon contract expiration were retained through continuous signup.	CRP/National

Author(s)	Year	Source	Title	Focus	Program/ Scope
Moorhead, D. J. and C.W. Dangerfield, Jr.	1996	Paper presented at the Symposium of the International Union of Forestry Research Organizations, Approaches to Extension in Forestry - Experiences and Future Development, Munich/Freising, Germany, September 30-October 4	Conservation Reserve Program: Public Issues and Policy Education for Sustainable Agriculture Through Forestry	Described the positive economic benefits of the CRP in Georgia, which are linked to long-term timber growth, and how research results were disseminated to the public.	CRP/State (GA)
Moulton, R.J., B. Baldwin, and J. Snellgrove	1991	In, Prec. Of the Southern Forest Economists Annual Meeting, Feb. 20-22, 1991, Washington D.C.	Impacts of Conservation Reserve Program tree planting on biological diversity	Sampled CRP plantations to address the issue of tree plantation size and how it links to CRP success.	CRP/Regional (Southeast U.S.)
Murdock, L., J. Herbek, L. Townsend, D. Hershman, J. Martin, M. Rasnake, D.B. Hill, B. Clark, and R.L. Trimble	1997	University of Kentucky, College of Agriculture, Cooperative Extension Service, ID-124	Factors to Consider when Bringing Conservation Reserve Program (CRP) Land or Idle Land Back into Production	Looked at factors to consider, such as which cropping system to use, pests that will be encountered, fertility status of the field, other nontraditional options, and the economics of bringing land back into production after CRP contract expiration.	CRP/National
Nakao, M., B. Sohngen, L. Brown, and R. Leeds	1999	Fact Sheet AE-0006-99, Ohio State University Extension-Agricultural Economics	The Economics of Vegetative Filter Strips	The profitability of hay, grass and legumes, intensively managed timber and non-intensively managed timber were compared assuming cost-share under CRP.	CRP-Continuous/ State (OH)
Napier, T.L.	1987	In, Impacts of the Conservation Reserve Program in the Great Plains, Symposium Proceedings, September 16-18, USDA, FS, Rocky Mountain Forest and Range Station, Fort Collins, CO, General Technical Report RM-158	Anticipated Changes in Rural Communities Due to Financial Stress in Agriculture: Implications for Conservation Programs.	Discussed farm sector financial crisis of 1980s and the role played by the CRP.	CRP/National

Author(s)	Year	Source	Title	Focus	Program/ Scope
Nelson, C., D. Strohbehn, S. Barnhart, R. BreDahl, E. Edwards, and L. Sternweis	1994	Conservation Reserve Program: Issues and Options, CRP-14, Iowa State University-University Extension, October.	Adams County CRP Research and Demonstration Project	Project demonstrated that livestock production under rotation grazing is the most profitable use of expiring CRP land subject to HEL conservation compliance.	CRP/State (IA)
Newman, J.B.	1987	In Impacts of the Conservation Reserve Program in the Great Plains, Symposium Proceedings, September 16-18, 1987, USDA, FS, Rocky Mountain Forest and Range Station, Fort Collins, CO, General Technical Report RM-161	Overview of the Present Land-use Situation and the Anticipated Ecological Impacts of Program Implementation	Examined and projected changes in land use patterns in the Great Plains, and discussed the regional ecologic changes occurring from the initiation of the CRP.	CRP/Regional (Great Plains)
Ogg, C.W., M.P. Aillery, and M.O. Ribaudo	1989	Agricultural Economic Report No. 618, United States Department of Agriculture, Economic Research Service, , October	Implementing the Conservation Reserve Program: Analysis of Environmental Options	Examined costs and benefits of enrolling irrigated land in high saline soils and in ground water depletion areas, erodible land in watersheds with high sediment and nutrient pollution problems, buffer strips along streams, and cropped wetlands.	CRP/National
Onianwa, O. O, G.C. Wheelock, M.R. Dubois, and S.T. Warren	1999	Southern Journal of Applied Forestry, 23(2): 83-87	Assessing the Retention Potential of Conservation Reserve Program Practices in Alabama	Surveyed CRP participants on practice retention upon contract expiration, and explored any differences between minority and white participants.	CRP/State (AL)
Parks, P. J. and J.P. Schorr	1997	Journal of Environmental Economics and Management, 32: 85-94	Sustaining Open Space Benefits in the Northeast: An Evaluation of the Conservation Reserve Program	Enrollment patterns by farm type, income source and location(metropolitan versus non-metropolitan) were used to examine the incentives to enroll in CRP.	CRP/State (NY)

Author(s)	Year	Source	Title	Focus	Program/ Scope
Patterson, M.P. and L.B. Best	1993	American Midland Naturalist, 135: 153-167	Bird abundance and nesting success in Iowa CRP fields: The importance of vegetation structure and composition	Examined the correlation between vegetative structure/composition and bird abundance in CRP fields.	CRP/State (IA)
Piper, S.	1990	Applied Agricultural Research, 3 (5): 153-158	Considering offsite wind erosion benefits in the decision to implement soil conservation practices: an example using the Conservation Reserve Program	Examined the offsite and onsite benefits from wind erosion in CRP, which helped to determine what socially desirable level of soil conservation was needed.	CRP/Regional (Western U.S.)
Plantinga, A. J., R. Alig, and H. Cheng	2001	Resources, Conservation and Recycling, 31: 199 – 215	The Supply of Land for Conservation Uses: Evidence from the Conservation Reserve Program	Examined the impact of opportunity cost on CRP enrollment and the potential for tree planting.	CRP/Regional
Poe, G.L.	1998	Agricultural and Resource Economics Review, 27(1): 117-124	Property Tax Distortions and Participation in Federal Conservation Programs: An Exploratory Analysis of the Wetlands Reserve Program	Examined varying role of property taxes before and after granting of an easement on enrollment in the Wetlands Reserve Program	Supporting Science

Author(s)	Year	Source	Title	Focus	Program/ Scope
Poe, G.L.	1999	Society and Natural Resources, 12(2): 571-98	Maximizing the Environmental Benefits per Dollar Expended: An Economic Interpretation and Review of Agricultural Environmental Benefits and Costs	Reviewed research on agricultural environmental benefits and costs, broadly categorized as amenity value and ground and surface water contamination.	CRP/National
Powell, M.R. and J.D. Wilson	1997	Resources for the Future, Discussion Paper 97-49, August 1997	Risk Assessment for National Natural Resource Conservation Programs	Reviewed risk assessments prepared by the USDA in support of regulations implementing CRP and EQIP.	CRP/National
Renner, R.W., R.E. Reynolds, and B.D.J. Batt	1995	Transactions of the North American Wildlife and Natural Resource Conference, 60: 221-229	The impact of haying Conservation Reserve Program lands on productivity of duck nesting in the Prairie Pothole region of North and South Dakota	Compared nest success and duck production in hayed and non-hayed CRP fields.	CRP/Regional (Prairie Pothole)
Reynolds, R.	1992	United States Fish & Wildlife Service, Progress Report, Bismark, ND	Evaluation of the effect of CRP on duck recruitment in the prairie pothole joint venture area of Fish & Wildlife Service, Region 6	Reported the 1992 results of a pilot effort to evaluate waterfowl production in CRP grasslands compared to Waterfowl Production Areas.	CRP/Regional, State (Prairie Pothole) (MT, SD, ND)

Author(s)	Year	Source	Title	Focus	Program/ Scope
Reynolds, RE., T.L. Shaffer , R,W. Renner , W.E. Newton, and B.D.J. Batt	2001	Journal of Wildlife Management, 65(4): 765-780	Impact of the Conservation Reserve Program on duck recruitment in the U.S. Prairie Pothole Region	This study evaluated the success of five duck species nesting in CRP fields vs. nearby Waterfowl Production Areas (WPA) throughout the Prairie Pothole Region.	CRP/Regional (Prairie Pothole) (MT, SD, ND)
Ribaudo, M. O.	1989	AER-606, USDA,ERS	Water Quality Benefits from the Conservation Reserve Program	Attempted to comprehensively measure the water quality benefits of CRP by linking soil erosion on a field to off-site water uses.	CRP/National, Regional
Ribaudo, M. O. and Piper, S.L.	1991	Water Resources Research, July, 27(7): 1757-1763	Estimating Changes in Recreational Fishing Participation from National Water Quality Policies	Estimated the benefits of recreation water quality improvement from the CRP.	CRP/National
Ribaudo, M. O., D. Colacicco, L.L. Langner, S. Piper, and G.D. Schaible	1990	AER-627, USDA, ERS,	Natural Resources and Users Benefit from the Conservation Reserve Program	Estimated the economic benefits of the CRP under three different land targeting scenarios: targeting land for tree planting, targeting environmentally sensitive land; and continuing the existing program	CRP/National, Regional
Ribaudo, M.O., D. Hoag, M. Smith, and R. Heimlich	2001	Ecological Indicators, (I): 11-20	Environmental indices and the politics of the Conservation Reserve Program	Reviewed CRP to determine how environmental indicators were developed and used, then assessed the results of such applications.	CRP/National

Author(s)	Year	Source	Title	Focus	Program/ Scope
Rickerl, D.H., J.H. Gritzner, P.K. Wieland, and G. Rial	1999	American Journal of Alternative Agriculture, 14(2): 78-84	Geographic Information Systems for Selection of CRP Tracts to Meet Different Management Goals after Contract Expiration.	Used GIS and CRP tract maps to identify best use of land after contract expiration: return to row crop production or pasture, or re-enrollment in CRP to meet groundwater, wildlife habitat and surface water quality objectives.	CRP/National, Local (SD) (Watershed)
Robel, R.J., J.P. Huges, S.D. Hull, K.E. Kemp, and D.S. Klute	1998	Journal of Range Management, 51 (2): 132-138	Spring burning: resulting avian abundance and nesting in Kansas CRP	Investigated spring burning effects on avian species in Kansas CRP fields.	CRP/State (KS)
Rodenhouse, N.L. and L.B. Best	1983	American Midland Naturalist, 110 (2): 265-275	Breeding ecology of vesper sparrows in corn and soybean fields	Examined how corn and soybean effected vesper sparrows.	Supporting Science
Rodgers, R.D.	1999	Wildlife Society Bulletin, 27: 654-665	Why haven't pheasant populations in western Kansas increased with CRP?	Examined the pheasant population decline and its connection to CRP.	CRP/State (KS)
Ryan, M.R., L.W. Burger, and E.W. Kurzejeski	1998	Journal of Production Agriculture, (11): 61-66	The impact of CRP on avian wildlife: a review	Assessed the impact of CRP on bird populations in the central U.S.	CRP/Regional (Central U.S.)
Samson, F. and F. Knopf	1994	Bioscience, 44: 418-421	Prairie conservation in North America	Discussed the degradation of native prairies and possible management solutions.	Supporting Science
Schmutz, J.K.	1987	Journal of Range Management, 40 (5): 438-440	The effect of agriculture on Ferruginous and Swainson's hawks	Summarized the effects of cultivation and agricultural activity on hawk densities.	Supporting Science

Author(s)	Year	Source	Title	Focus	Program/ Scope
Schultz, S. and D.K. Lambert	1999	Paper presented at 1999 W-133 Meetings, Tucson, AZ	Implicit Prices of CRP Enrollments, Wetlands and Soil Quality in North Dakota	Examined the impact of CRP rents on farmland values using hedonic analysis.	CRP/State (ND)
Schumacher, T.E., M.J. Lindstrom, M.L. Blecha, and G.W. Langdale	1995a	In, Crop Residue Management To Reduce Erosion and Improve Soil Quality-Southeast, United States Department of Agriculture, Agricultural Research Service (ARS), Conservation Research Report Number 39, January 1995	National Perspectives on Management Options for Lands Concluding Their Tenure in the Conservation Reserve Program (CRP)	Addressed the options for post-CRP land related to ground cover, grass types, long-tern soil improvement, and management strategies in the Southeast portion of the U.S.	CRP/Regional (Southeast U.S.)
Schumacher, T.E., M.J. Lindstrom, M.L. Blecha, and L.N. Mielke	1995b	In, Crop Residue Management To Reduce Erosion and Improve Soil Quality-North Central, United States Department of Agriculture, Agricultural Research Service (ARS), Conservation Research Report Number 42, November 1995	National Perspectives on Management Options for Lands Concluding Their Tenure in the Conservation Reserve Program (CRP)	Addressed the options for post-CRP land related to ground cover, grass types, long-tern soil improvement, and management strategies in the North Central portion of the U.S.	CRP/Regional (North central U.S.)
Schumacher, T.E., M.J. Lindstrom, M.L. Blecha, and R.I. Papendick	1995c	In, Crop Residue Management To Reduce Erosion and Improve Soil Quality-Northwest, United States Department of Agriculture, Agricultural Research Service (ARS), Conservation Research Report Number 40, May 1995	National Perspectives on Management Options for Lands Concluding Their Tenure in the Conservation Reserve Program (CRP)	Addressed the options for post-CRP land related to ground cover, grass types, long-tern soil improvement, and management strategies in the Northwest portion of the U.S.	CRP/Regional (Northwest U.S.)
Schumacher, T.E., M.J. Lindstrom, M.L. Blecha, N.P. Cogo, D.E. Clay, and B.H. Bleakley	1995	In, Proc. Clean Water-Clean Environment 21 Century, Kansas City, MO, (III): 239-242	Soil Management after CRP Contract expire	Examined tillage system effects on soil loss, surface runoff, and microbial activity after land comes out of CRP.	CRP/National

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Smith, M.	1999	Agricultural Outlook, June-July 1999, USDA, ERS, 23-26	Conservation Reserve Program Approaches Acreage Limit	Provided background of the CRP, the distribution of enrolled land, and the average EBI subfactor scores for the most recent signups.	CRP/National, Regional
Smith, M.	2000	Agricultural Outlook, December 2000, USDA, ERS	Conservation Reserve Enhancement Program: Early Results from a Federal-State Partnership	Discussed the impediments and incentives for states to adopt CREP.	CREP/National
Sovada, M.A., M.C. Zicus, R.J. Greenwood, D.P. rave, W.E. Newton, R.O. Woodward, and J.A. Beiser	2000	Journal of Wildlife Management, 64: 820-831	Relationship of habitat patch size to predator community and survival of duck nests	Size of discrete CRP fields were examined for composition or predator communities and duck nest success.	CRP/Regional (Prairie Pothole)
Stauffer, D.F., G.A. Cline, and M.J. Tonkovich	1990	Transactions of the North American Wildlife and Natural Resources Conference, 55: 75-76	Evaluating potential effects of CRP on bobwhite quail in Piedmont, Virginia	Addressed how position and interspersion of CRP land effected local quail populations.	CRP/State (VA)
Strassmann, B.I.	1987	Environmental Management, 11 (1): 35-44	Effects of cattle grazing and haying on wildlife conservation at National Wildlife Refuges in the United States	Examined the effects of cattle grazing and haying on vegetative ecology and its correlation with wildlife conservation efforts.	Supporting Science
Swanson, D.A., D.P. Scott, and D.L. Risley	1999	Journal of Soil and Water Conservation, 54 (1): 390-394	Wildlife benefits of the conservation reserve program in Ohio	Examined how CRP grasslands were correlated with grassland dependent avian species.	CRP/State (OH)

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Szentandrasi, S., S. Polansky, R. Berrens, and J. Leonard	1995	Growth and Change, 26: 383-404	Conserving biological diversity and the Conservation reserve Program	Described a method that could be used to retarget CRP, so the program would likely address larger populations of threatened and endangered species.	CRP/National, State (OR)
Torbert, H.A., S.A. Prior, and D.W. Reeves	1999	Soil Science Society of America Journal, 30 (9&10): 1345-1359	Land management effects on nitrogen and carbon cycling in an Ultisol	Examined the impact of land management systems on carbon (C) and nitrogen (N) cycling in an Ultisol in Alabama.	CRP/State (AL)
United States Department of Agriculture (USDA)	2001	In, Food and Agricultural Policy: Taking Stock for the New Century, September 2001, 72-87	Conservation and the Environment	Discusses conservation policy, stewardship, and land retirement.	CRP/National
United States Department of Agriculture, Economic Research Service (ERS)	1997	USDA, ERS, Agricultural Handbook No. 712.	Agricultural Resources and Environmental Indicators, 1996-97, Chapter 6, Conservation Reserve Program	Detailed description of the history of the CRP, development of the EBI, and accomplishments to date.	CRP/National, Regional
United States Department of Agriculture, Economic Research Service (ERS)	2000a	In, Agricultural and Resource Economics Indicators, Chapter 4.2, USDA, ERS, Resource Economics Division	Soil Management and Conservation	Summarized the economic impacts of the CRP.	CRP/National
United States Department of Agriculture, Economic Research Service (ERS)	2000b	In, Agricultural and Resource Economics Indicators, Chapter 6.2, USDA, ERS, Resource Economics Division	Land Retirement	Provided a review of the CRP and WRP from their inception, including acres enrolled, cover practices, the EBI, and a summary of costs and benefits.	CRP/National

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United States Department of Agriculture, Economic Research Service (ERS)	2000c	Agricultural Outlook, December 2000	Conservation Reserve Enhancement Program: Early Results from a Federal-State Partnership	This bulletin acknowledged the need to measure the economic effectiveness of CREP and how/what way funds are allocated.	CREP
United States Department of Agriculture, Farm Service Agency (FSA)	Rev. Oct. 2001	United States Department of Agriculture Pamphlet: PA-1603	The Conservation Reserve Program	Program overview and facts.	CRP
United States Department of Agriculture, Farm Service Agency (FSA)	1999	United States Department of Agriculture, Farm Service Agency, September 1999	Fact Sheet: Conservation Reserve Program Sign-Up 20, Environmental Benefits Index	Detailed the cover practices and points awarded to a CRP applicant using a rating system.	CRP/National
United States Department of Agriculture, Natural Resources Conservation Service (NRCS)	Accessed 18 Jan.2002	Online Publication, http://www.nhq.nrcs.usda.gov/CCS/BufrsPub.html	Buffers, Common-Sense Conservation	Addressed the concept of buffers, various types, their use, and the monetary and environmental value as related to CRP-Continuous Sign-up.	CRP-Continuous
United States Department of Agriculture, Natural Resource Conservation Service (NRCS)	2002	Webpage, http://www.greatplains.org/resource/1999/mancrp/mancrp.htm	Managing your CRP for wildlife	Addressed the issue of wildlife habitat management and enhancement practices to better target CRP objectives.	CRP/National
United States General Accounting Office (GAO)	2002	Report to the Committee on Agriculture, Nutrition, and Forestry, U.S. Senate, GAO-02-295	Agricultural Conservation, State Advisory Committee' View on How USDA Programs Could Better Address	Provided views from members of state technical committees on the effectiveness of USDA conservation efforts in addressing environmental concerns related to	CRP/CREP

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			Environmental Concerns	agriculture.	
Varnedoe, L.E., Jr.	1995	Conservation Reserve Program Forest Land Opportunities, (13) November 1995	Recreational opportunities on CRP Lands	Compared consumptive and non-consumptive uses of recreational lands, along with wildlife associated recreation.	CRP/National
Wachob, D.G.	1997	Ph.D. dissertation, University of Wyoming, Laramie, WY	The effects of the Conservation Reserve Program on wildlife in southeastern Wyoming	Related vegetative and spatial characteristics of CRP land to habitat use by nongame birds, raptors, small rodents, top carnivores, and big game.	CRP/State (WY)
Walsh, M.E., D. Becker, and R.L. Grahan	1996	Proc. Bioenergy '96 - The Seventh national Bioenergy Conference: Partnerships to Develop and Apply Biomass Technologies, September 15-20, Nashville, TN	The Conservation Reserve Program as a Means to Subsidize Bioenergy Crop Prices	Discussed the impact on bioenergy crop prices of two types of government subsidies: a deficiency payment, and a reduced CRP rental rate.	CRP/Regional (mid-Plains and eastward)
Weitman, D.	1994	In, When Conservation Reserve Program contracts expire: The policy options, Soil and Water Conservation Society, Ankeny, IA, 20-22	Water quality improvement and wetlands restoration	Addressed the importance of water quality and wetland benefits related to CRP.	CRP
White, L.D.	1987	In Impacts of the Conservation Reserve Program in the Great Plains, Symposium Proceedings, September 16-18, 1987, USDA, FS, Rocky Mountain Forest and Range Station, Fort Collins, CO, General Technical Report RM-160	Improving Ranch/Farm Success Through Total ranch Management Planning	Addressed the idea of Total Ranch Management Planning by utilizing goal achievement through the selection of tactical alternatives and operational activities within ranch/farm resources.	Supporting Science

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Wienhold, BJ and D.L. Tanaka	2000	Soil Science Society of America Journal, 64:379-381	Haying, tillage, and nitrogen fertilization influences on infiltration rates at a Conservation Reserve Program site	Analyzed the effects of haying (hayed or not hayed prior to tillage), tillage (no-tillage, minimum tillage, or conventional tillage), and nitrogen fertilization on surface infiltration rates at a CRP study site.	CRP/Regional (Midwest)
Wildlife Management Institute	2001	A Wildlife Management Institute Report, January 2001	How Much is Enough for 2002? A Regional Habitat Needs Assessment for the 2002 Farm Bill	This document identified national & regional wildlife needs & goals & provides some recommendations about what is needed in the 2002 farm bill.	CRP/National, Regional (Various regions throughout the U.S.)
Williams, B.K., M.D. Koneff, and D.A. Smith	1999	Journal of Wildlife Management, 63: 417-440	Evaluation of waterfowl conservation under the North American waterfowl Management Plan	Reviewed efforts evaluating the North American Waterfowl Management Plan and made recommendations.	Supporting Science
Woods, M.D. and L.D. Sanders	1987	In, Impacts of the Conservation Reserve Program in the Great Plains, Symposium Proceedings, September 16-18, 1987, USDA, FS, Rocky Mountain Forest and Range Station, Fort Collins, CO, General Technical Report RM-158	History and Economics of Farm Bill Legislation and the Impacts on Wildlife Management and Policies.	Forecasted the possible economic, community and social impacts of high CRP enrollment on an agriculturally-dependent economy.	CRP/Regional/State (Great Plains) (OK)
Wu, J.	2000	American Journal of Agricultural Economics, 82(4): 979-992	Slippage Effects of the Conservation Reserve Program	Examined the prevalence of slippage.	CRP/Regional/State (12 states in the Corn Belt, Lake States and Northern Plains)

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Wu, J., M.D. Nellis, M.D. Ransom, K.P. Prive, and S.L. Egbert	1997	Journal of Soil and Water Conservation, 52 (5): 352-358	Evaluating soil properties of CRP land using remote sensing and GIS in Finney County, Kansas	Addressed the value of GIS and remote sensing for evaluating and monitoring CRP.	CRP/Local (Finney County, KS)
Yang, W., M. Khanna, R. Farnsworth, and H. Onal	2001	2001 AAEA-CAES Annual Meeting, August 5-8 in Chicago, IL ,paper selected for presentation	Cost Effective Targeting of Land Retirement to Improve Water Quality: A Multi-Watershed Analysis	Developed an integrated watershed management framework that combined economic, hydrological and GIS modeling to help identify more cost effective land retirement patterns, while achieving environmental objectives at the least cost.	CREP/State (IL)
Young, C. E. and C. T. Osborn	1990	AER- 626, USDA, ERS	The Conservation Reserve Program	The economic benefits and costs of the CRP were estimated using three scenarios: a forestry emphasis, an environmental emphasis, and expansion of the enrollment limit.	CRP/National, Regional