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Soil and Water Resources Conservation Act
National Conservation Program
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CROPLAND CONSERVATION ANALYSIS #3
THE CONSEQUENCES OF RETURNING CONSERVATION RESERVE PROGRAM ACRES TO PRODUCTION

The Issue

The Conservation Reserve Program (CRP), first authorized in the 1985 farm bill, is a voluntary program administered by USDA's Farm Service Agency (FSA). Under CRP, producers with eligible farmland enter into 10- to 15-year contracts to establish and maintain a long-term conserving cover of grasses and/or trees to reduce soil erosion, improve water quality, and enhance wildlife habitat. National enrollment has been constrained by an acreage limit of 32 million acres since October 2010. A county-level limit generally constrains enrollment to 25 percent of any county's total cropland acreage. Fiscal year 2012 started with 29.6 million acres in the program, down from a high of 36.8 million acres at the end of fiscal year 2007 (fig. 1).

Cropland regularly enters and leaves CRP as new land is enrolled and as CRP contracts expire without re-enrollment. The current high commodity prices increase the appeal for landowners to return expiring CRP lands to production agriculture.[1] In addition, successive Farm Bills and consequent CRP policy reshape the program every 5 years or so. As a result of tight Federal budgets, high crop prices, and national food and energy security concerns, a smaller CRP is being discussed for the next Farm Bill.

This analysis evaluates the potential adverse environmental and cost impacts of returning CRP land to working cropland, and offers insights for minimizing these impacts. Just as the Environmental Benefits Index (EBI) used to rank offers for General Signup CRP favors high-favorable-impact, low-cost

[1] A small percentage of CRP landowners choose to remove acres before their contracts expire, despite a risk of incurring financial penalties for doing so.

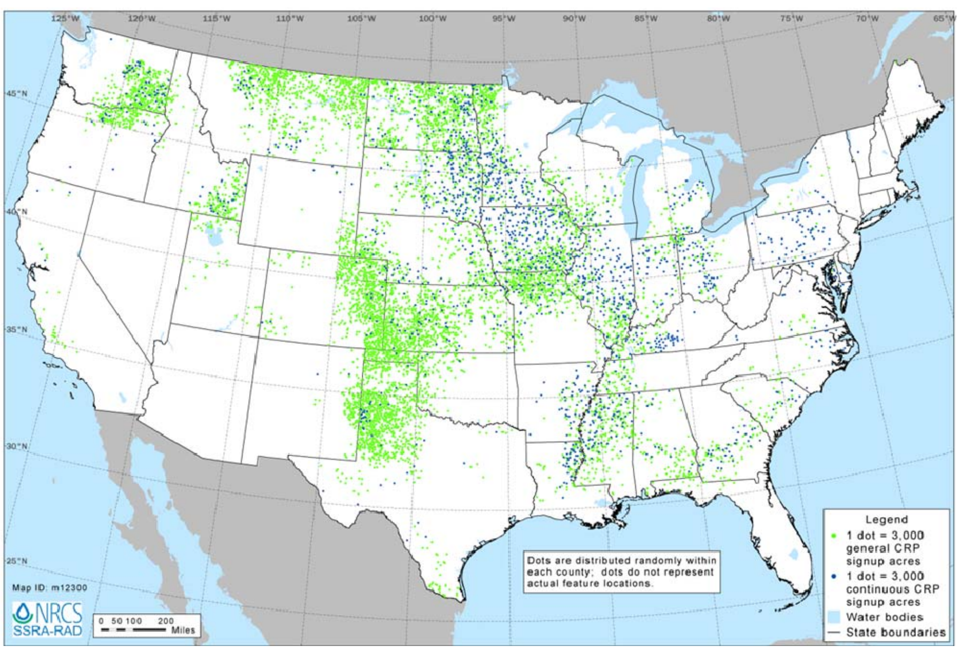


Figure 1. Density of current CRP enrolled acres

How Does CRP Work?

Once they have enrolled land in the CRP, contract holders receive annual rental payments (based on county-level cash rental rates adjusted for soil productivity and other factors), cost-share assistance for establishing and maintaining long-term conserving cover, and, in some cases, incentive payments. These payments have totaled nearly $2 billion annually in recent years. To be eligible for enrollment, fields must meet CRP's crop history requirements and either be designated as highly erodible land (HEL), fall within national or State-designated conservation priority areas, or be enrolled in an expiring CRP contract.

The largest component of CRP is General Signup CRP, which enrolls land during periodic national signups. Producers typically offer whole fields for enrollment during these signups. Offers for general signup enrollment are ranked and selected according to cost and benefit factors, which are synthesized in an Environmental Benefits Index (EBI). While the initial focus of CRP was soil erosion and cost, the EBI now also considers water quality, air quality, and wildlife habitat.

Since 1996, producers also can enroll via a "continuous signup" process available year round. Continuous Signup CRP has been steadily increasing in importance and currently constitutes 17 percent of total CRP enrollment. Figure 1 depicts the density of current enrollment for both General Signup CRP and Continuous Signup CRP. Land targeted for specific practices to address specific environmental concerns, such as aquifer recharge, agricultural runoff, and wildlife habitat, is accepted into the program without having to wait for a signup period. Enrollments tend to be relatively small in size and involve buffers and wetland-related practices. Continuous Signup CRP often encourages enrollment by offering incentives beyond the annual program payment and cost share assistance that General Signup offers.

The Conservation Reserve Enhancement Program (CREP) is a form of Continuous Signup CRP that involves close collaboration with State governments and local partners to address geographically specific concerns with tailored conservation systems. Both USDA and States contribute to the significant incentives that CREP offers to enhance participation and ensure that conservation concerns are addressed.

For more information on CRP, visit: http://www.fsa.usda.gov/FSA/webapp?area=home&subject=copr&topic=crp

lands for enrollment, a re-enrollment strategy that targets parcels with the greatest net benefits will help stretch the conservation dollar. The scope of this analysis is narrower than one that seeks to identify the socially optimal size of CRP. Such a comprehensive assessment would also consider the environmental and cost impacts of enrolling new land in CRP.

Methodology Used in this Analysis

To estimate the soil health, carbon sequestration, water quality, and aquifer recharge impacts of returning CRP land to working cropland, a "without-CRP" scenario is simulated. This scenario assumes that working lands conservation practices (structural and management practices applied to fields being cropped) will be adopted on CRP land returned to crop production to the same degree that practices have been adopted on similar cropland.[2]

This analysis utilizes data from the Conservation Effects Assessment Project (CEAP) Cropland National Assessment. CEAP assessments use a field-scale physical process model—the Agricultural Policy Environmental Extender (APEX)—to simulate day-to-day farming activities and their environmental impacts. Input data on crop production, management, and conservation practices were collected from 2003 through 2006 at over 18,000 cropped sample and 12,767 CRP sample points. The CRP sample points, which represent 30.5 million acres of General Signup CRP (out of 31.6)[3] and none of the 2.7 million acres of Continuous Signup CRP in fiscal year 2003, are used to estimate "with-CRP" environmental services.[4] From this point forward, General Signup CRP land is referred to as CRP land.

Environmental Services Provided by the CRP

For soil health, water quality, and aquifer recharge, criteria are identified beyond which adverse impacts are considered excessive, and the fraction of CRP land estimated to produce excessive impacts if returned to crop production is reported. The criteria for the four water quality indicators

[2] The "without-CRP" scenario is developed using the NRI "donor point" approach: Up to seven cropped sample points are matched to each CRP sample point on the basis of slope, soil texture, soil hydrologic group, and geographic proximity. The cropping practices used and the crops grown at each of these cropped points are "donated" to the associated CRP point. Impacts are estimated for each donor point-CRP sample point combination and are averaged together for each CRP sample point.

[3] The CEAP data do not reflect General Signup CRP acres in the Mountain West water resource region, which consists primarily of rangeland and contains little CRP (see fig. 1).

[4] The CEAP data are only recently available to assess CRP nationally. In lieu of the CEAP data, FSA has been quantifying and reporting the annual erosion and water quality impact of the program since 2007 using the same modeling approach as CEAP and applying to it a different, much smaller set of representative soils data. Conventional and conservation tillage cropping scenarios and a long-term conserving cover scenario are simulated. For more information on the FSA reports, visit: http://www.fsa.usda.gov/FSA/webapp?area=home&subject=ecpa&topic=nra

considered in this analysis (edge-of-field sediment loss, nitrogen loss with surface runoff, nitrogen loss through leaching, and total phosphorus loss) have been peer reviewed and published in CEAP cropland assessment reports. The criteria for soil health and aquifer recharge indicators are intuitive: Would crop production on that CRP sample point deplete soil organic carbon or contribute to groundwater depletion?

Per acre impacts are estimated for the 30.5 million acres of CRP that the CEAP data represent and are summarized and presented as cumulative distributions and averages. The cumulative distributions indicate the fraction of CRP land estimated to generate an impact in excess of the specified criteria if returned to crop production. Averages are also reported. Note that median impact can be discerned from the cumulative distribution; average impact cannot.

Given current high commodity prices and the pressure to remove relatively productive land from the program, we report the average annual impact per acre for the most productive 20 percent of CRP land,[5] along with the fraction of this CRP land that exceeds the criteria considered.[6]

There are four major caveats to consider in relating estimated soil health, carbon sequestration, water quality, and aquifer recharge impacts in this report to the current program:

- While the estimates we report do not include all impacts, they are the best readily available indicators of impacts. Sediment and nutrient losses from the field are reported for water quality, for example, since nationwide measures of changes in the chemistry and structure or even the biotic integrity of surface waters are not currently available.

- The CEAP data reflect the CRP in 2003–06, while the program has changed considerably in the interim. General Signup CRP is less than 80 percent the size it was in 2003. Thirty-eight percent of 2003 General Signup CRP land is no longer in the program in 2012; 20 percent of land now in the program was not in CRP in 2003. Environmental impacts of returning current CRP land to production agriculture may be larger than what CEAP data reflect because of the shift toward Continuous Signup CRP since 2003.

- Since none of the 2.7 million acres of Continuous Signup CRP in fiscal year 2003 are considered here, the impact of the loss of Continuous Signup CRP acres is not assessed.[7]

- General Signup CRP is assumed to promptly return to crop production and adopt working lands conservation practices to the same degree as similar cropland. This assumption overestimates the environmental impacts of land leaving CRP to the extent that some expired enrollments will not revert to cultivated cropland. It also underestimates the impacts to the degree to which expired CRP land exhibits the relatively lower adoption rates of working lands conservation practices on rented cropland.[8]

Given the diversity of wildlife habitat that CRP supports, no indicator adequately summarizes an enrollment's wildlife habitat value. Here, the fraction of CRP land that is located within geographic areas associated with important wildlife species or groups is used as an indicator of program-wide benefit (using the CEAP CRP sample point locations). Wildlife groups used in the analysis include:

- Species of particular value to the rural economy are represented by waterfowl, using continentally important waterfowl area data.

- Species of concern due to rare or declining populations are represented by the current ranges of sage-grouse and lesser prairie-chicken.

- Given the rarity of tallgrass prairie, its historical extent is used to conservatively represent imperiled grassland species that respond strongly to CRP.

On the one hand, this approach to wildlife habitat impacts is conservative in that a very select set of species and ecosystems are considered. On the other hand, the approach liberally assumes that the CRP enrollments within these areas provide suitable habitat conditions for relevant species.

[5] CRP points are ranked by crop productivity using the APEX model yield estimates. Multiple crops may apply to the same donor point-CRP point combination. Results are averaged together for each CRP point.

[6] We also examined the top 10 percent. Given the similarity of results for the top 10- and 20-percent categories, we report just the latter for the sake of brevity.

[7] The conservation practices for which Continuous Signup CRP provided financial support are in some cases included in the donor points used to simulate typical conservation levels in the "without CRP" scenario, and thus moderate the simulated results slightly.

[8] CRP enrollments returning to cropland may be more likely than other cropland to be rented, which could lead to lower than average conservation practice adoption rates. A relatively large fraction of contract holders have retired from farming—55 percent in 2001—and many have already reenrolled or otherwise extended their contracts (Allen and Vandever 2003). A return to crop production by the landowner after such a long time may entail considerable up-front cost, which a retired producer may be unlikely to undertake independently.

Soil Health and Carbon Sequestration

Although not the sole determinant, soil organic carbon (SOC) levels are integral to soil health. SOC accumulation also helps mitigate climate change through the capture and storage of atmospheric carbon. Maintaining a conserving cover of perennial grasses or trees minimizes excessive water- and wind-induced erosion, a primary impetus behind the development of the CRP. Sheet and rill erosion on cropped fields can often be controlled through establishment and maintenance of structural practices such as contour strips and terracing. For marginally productive lands with a potential for gully water erosion, such working lands practices may be too costly to adopt. Structural practices are also generally ineffective at addressing severe wind erosion. Without conservation treatment, however, soil health, and eventually crop yields, will decline.

Change in SOC level is a good metric for measuring the impact of a change in land use or land management on soil health and carbon sequestration. Changes in SOC are evaluated in two ways in the analysis. First, we look at the potential long-term impacts of CRP land returning to production agriculture by simulating the annual SOC accumulation or depletion rates in the "without-CRP" scenario. Of particular concern are conditions in which there are average annual losses of SOC. Persistent losses of SOC eventually degrade soil health to the point that the field will no longer support viable levels of crop production.

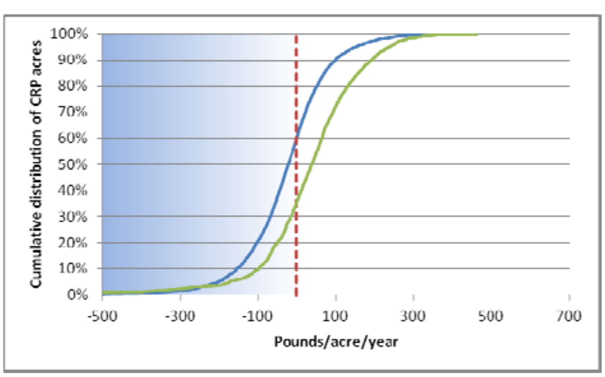
Figure 2 depicts the cumulative distribution of SOC accumulation if all General Signup CRP land were returned to crop production and if conservation practices typical of those used in 2003–06 were adopted. Lower SOC accumulation values indicate larger adverse impacts. SOC per acre would fall at an average rate of 28 pounds annually in the "without-CRP" scenario. As indicated by where the cumulative distribution crosses the criterion of 0, 60 percent of the General Signup CRP acres would lose SOC. In contrast, the most productive 20 percent of CRP land would on average see SOC accumulate at 26 pounds per acre per year, with only 34 percent of this relatively productive land estimated to lose SOC over time.

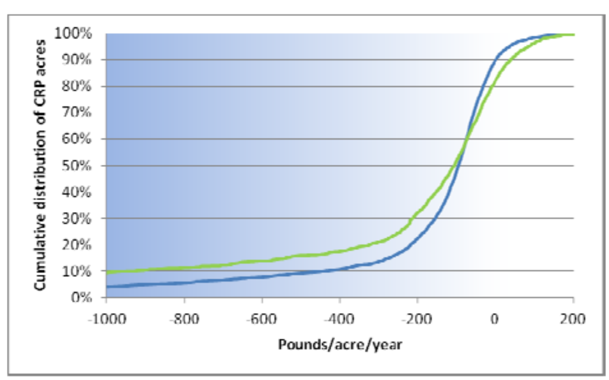
The second way to evaluate SOC impact is by comparing SOC accumulation in the "with-" and "without-CRP" scenarios. Converting CRP land to cultivated cropland would generate a net loss in SOC for nearly all CRP acres (fig. 3). According to the CEAP data, CRP land returned to crop production would sequester on average 195 fewer pounds of carbon annually per acre than they would under long-term conserving cover. SOC loss is 40 percent higher on the most productive 20 percent of CRP land—274 pounds per acre annually.[9] These estimates are conservative since they do not include carbon sequestered in living biomass.[10] This omission likely explains why a small fraction of CRP land appears (fig. 3) to sequester more carbon if converted to working cropland. It is also possible for cropland with reduced tillage to produce more soil carbon than CRP lands because of lack of nutrient inputs on CRP lands.

[9] The CEAP-based estimates also tend to be lower than earlier published studies. Eve et al. (2002) estimated the carbon sequestration response of converting continuously cropped land to CRP or rangeland at between 0.04 and 1.24 tons/acre/year, with 0.28, 0.21, and 0.20 tons/acre/year in the Corn Belt, Northern Great Plains, and Southern Great Plains, respectively. Differences may be due to a variety of factors, including a high degree of uncertainty in measurements of carbon sequestration, differing assumptions about conservation practice adoption across studies, and the evolution of scientific understanding of carbon storage within soil horizons.

[10] The estimates do not account for the chemical pathways by which wetland enrollments affect greenhouse gas emissions.

Figure 2 (left): Annual SOC accumulation under the "without-CRP" scenario. Figure 3 (right): The difference in annual SOC accumulation between "without- and with-CRP" scenarios. *Blue line represents all CRP land; green line represents 20% highest productivity CRP land; darker shading indicates greater adverse impact.*





Water Quality

Long-term conserving covers enhance the quality of receiving surface waters by reducing the transport of sediment and nutrients from and across fields. The change in hydrology also improves stream structure by slowing water movement and reducing scour and channel erosion during extreme weather events. Fertilizer and pesticide applications are effectively eliminated, and previously applied nutrients are metabolized by the perennial grass and/or tree cover. For water quality, potential impacts of the “without-CRP” scenario are assessed for sediment, nitrogen, and phosphorus losses using data and criteria developed for the CEAP cropland assessments. Sediment and nutrient losses are considered excessive when any of following four criteria is exceeded in the “without-CRP” scenario:[11]

- Average of 2 tons per acre per year for sediment loss at the edge of field.
- Average of 15 pounds per acre per year for nitrogen loss with surface runoff (soluble and sediment attached) at the edge of field.
- Average of 25 pounds per acre per year for nitrogen loss in subsurface flows at the edge of field.
- Average of 4 pounds per acre per year for phosphorus lost to surface water (soluble and sediment attached) at the edge of field.

Figures 4 through 7 depict the cumulative distributions for the four water quality metrics. Under production agriculture with typical levels of conservation treatment, sediment losses would be below the criterion on 86 percent of CRP land (fig. 4); nitrogen losses with surface runoff and subsurface flows would be below the criterion on 87 and 86 percent, respectively (figs. 5 and 6); and phosphorus losses would be below the criterion on 82 percent (fig. 7).

Table 1 reports the average annual sediment and nutrient losses per acre under the “without-CRP” scenario, including the fraction of land for which losses might be considered excessive because they exceed criteria. Results are also reported for the most productive 20 percent of CRP land. Whereas 28 percent of all CRP land exceeds at least one water quality criterion, 43 percent of the most productive CRP land does.

[11] The CEAP Cropland Assessments note that these levels do not necessarily provide adequate protection of water quality and/or meet Federal, State, and/or local water quality goals.

Figure 4–7: Annual sediment loss (top), nitrogen loss via surface pathways (second), nitrogen loss via subsurface pathways (third), and phosphorus loss (bottom from field under the “without-CRP” scenario. *Blue line in all charts represents all CRP land; green lines represent 20% highest productivity CRP land; darker shading indicates greater adverse impact.*

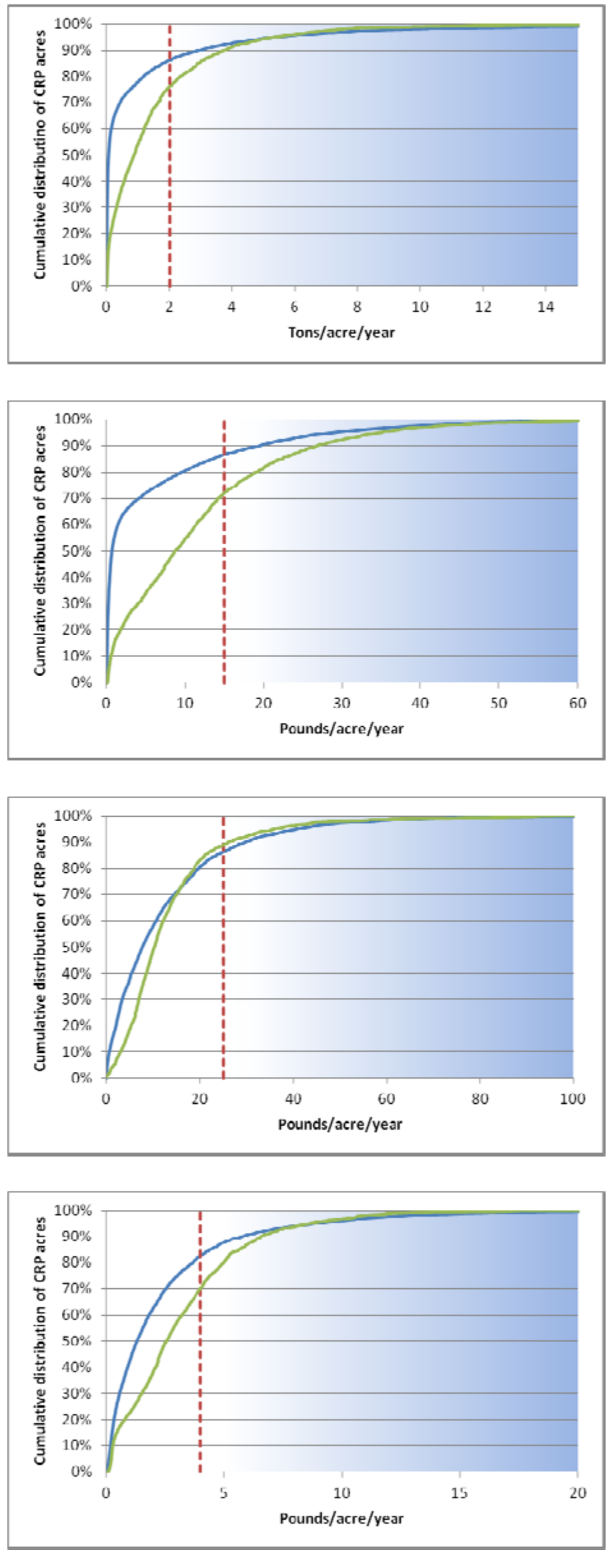


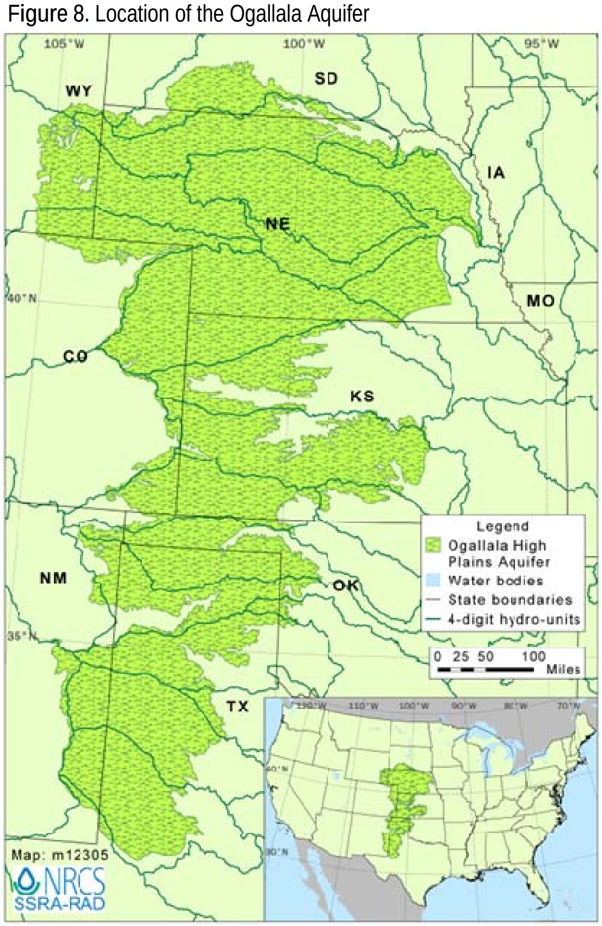
Table 1: Annual losses per acre under the "without-CRP" scenario

Metric	Average annual losses per acre			% exceeding criterion	
	All CRP	Top 20%	% difference	All CRP	Top 20%
Sediment (tons)	1.11	1.51	36	14	23
Surface N (lbs)	5.78	11.72	103	13	28
Subsurface N (lbs)	12.37	13.36	8	14	11
Total P (lbs)	2.40	3.16	32	18	30
Water Quality				28	43

Aquifer Recharge

In many areas, groundwater is in high demand for both drinking water and agriculture. Groundwater use can exceed groundwater recharge, a condition of "water mining" that is not sustainable. The Ogallala Aquifer, which accounts for about 30 percent of all groundwater used in the United States, is at the center of depletion concerns (fig. 8).[12] Approximately 95 percent of the water pumped from the Ogallala is used for irrigation, and 65 percent of all irrigated agriculture in the United States occurs in the Great Plains area that recharges this aquifer. Long-term conserving cover not only reduces groundwater use for irrigation but also increases recharge rates (Rao and Yang 2010).

Figure 8. Location of the Ogallala Aquifer

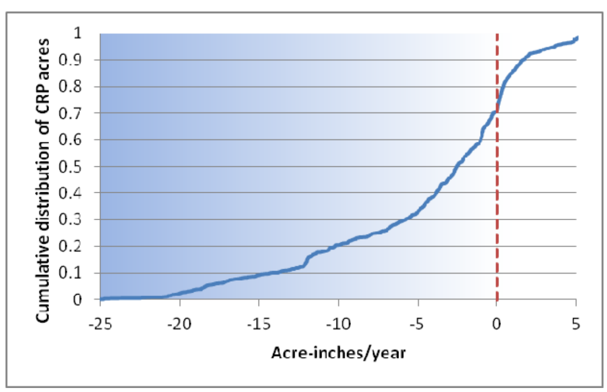


CRP's impact on aquifer recharge is assessed by first comparing the amount of irrigation water withdrawn to the amount returned to surface waters and aquifers in the "without-CRP" scenario. In light of the significance of the Ogallala Aquifer, and since "net return flow" otherwise encompasses withdrawals from and return flows to both ground and surface waters, we limit consideration of water availability to CRP land associated with the Ogallala Aquifer, 25 percent of the total. The resulting estimates are conservative in that they consider neither other aquifers in decline nor situations in which irrigation adversely impacts surface waters by reducing base flows to the degree that aquatic life is impaired.

Figure 9 shows that an estimated 71 percent of CRP land would withdraw more water from the Ogallala Aquifer than it would return to it if converted to crop production with typical levels of conservation practices. In other words, 71 percent is estimated to need irrigation. The average estimated net

[12] The development of center pivot irrigation precipitated a decline in Ogallala's water table, with dramatic reductions of over 100 feet in particular areas (Guru and Horne 2000).

Figure 9. Net return flows to Ogallala Aquifer under the "without CRP" scenario (darker shading indicates greater adverse impact)



return flow is -4.37 acre-inches annually. Since very little of the most productive 20 percent of CRP land is above the Ogallala Aquifer, that distribution is not reported.

Wildlife Habitat

Most farmers who choose to participate in CRP have the potential to create wildlife habitat by establishing long-term conserving covers of grasses and trees to establish or re-establish grasslands, forests, and wetlands (Haufler 2005, 2007). Because re-establishing native plant communities is expressly encouraged through the EBI ranking process of the General Signup CRP, CRP enrollments are more structurally and biologically diverse than crop monocultures.

It is difficult to fully quantify CRP wildlife habitat benefits because different bird, mammal, and other wildlife species have different requirements. For example, upland nesting ducks require dense nesting cover near wetlands, sage-grouse need a mixture of grasses, forbs and mature sage brush cover, and lesser prairie-chickens and many other species require large contiguous blocks of wildlife-friendly cover. In general, however, the wildlife habitat benefits of mature, maintained enrollments are likely to be large. As vegetation matures and habitat structure changes, associated changes in the wildlife community also typically occur. For example, while initial assessments determined that CRP covers were not attractive to Henslow's sparrow, mature CRP fields in the Midwest were found to provide important habitats for this at-risk grassland bird species, possibly contributing to reversing a long-term population decline (Herkert 2007). Similarly, Schroeder and Vander Haegen (2006) found that CRP fields planted with sagebrush were not suited to sage grouse until the plants matured. Moreover, they found a slight reversal in sage-grouse population decline in north-central Washington, where CRP provided an important habitat component on the landscape (Schroeder and Vander Haegen 2006).

The benefits of the CRP to wildlife are extensive, as reflected by the cooperation and coordination of wildlife and environmental organizations with USDA to develop and target CRP initiatives for wildlife. These initiatives include special enrollments for duck nesting habitat in the Northern Plains, upland bird habitat buffers within the range of the northern bobwhite, longleaf pine, and over 70 special State Acres for Wildlife Enhancement (SAFE) initiatives, as well as many CREP projects that target various terrestrial and aquatic species.

A number of academic studies have documented and quantified the positive impact of CRP on regionally important wildlife species, including grassland birds (Niemuth et al. 2007) and ducks (Reynolds et al. 2007) in the Prairie Pothole region, Henslow's sparrow in tall grass prairies (Herkert 2007), grassland birds and lesser prairie-chicken in the mixed grass and short-grass prairie regions of the Plains and Mountain states (PLJV 2007, 2009), sage-grouse in Washington (Schroeder and Vander Haegen 2006), northern bobwhite quail in the Southeast (Singleton et al. 2010), and ring-necked pheasant in nine Midwestern and Western states (Neilson et al. 2007). The strong and increasing response, for example, of lesser prairie-chickens to when CRP is present on the landscape is depicted in figure 10 (KDWPT 2011).

In general, researchers have identified "targeted enrollment and management of large fields or those adjoining other grasslands for grassland birds and small fields or those adjoining woodlands for shrub-scrub species" to be the best way to maximize CRP benefits for bird species (Wentworth et al. 2010). Enrollments that establish or contribute to large blocks of grass are particularly important for landscape species such as the lesser prairie-chicken, where CRP enrollments support up to 20% of the population goal for this species in Kansas (Playa Lakes Joint Venture 2007, Playa Lakes Joint Venture 2009).

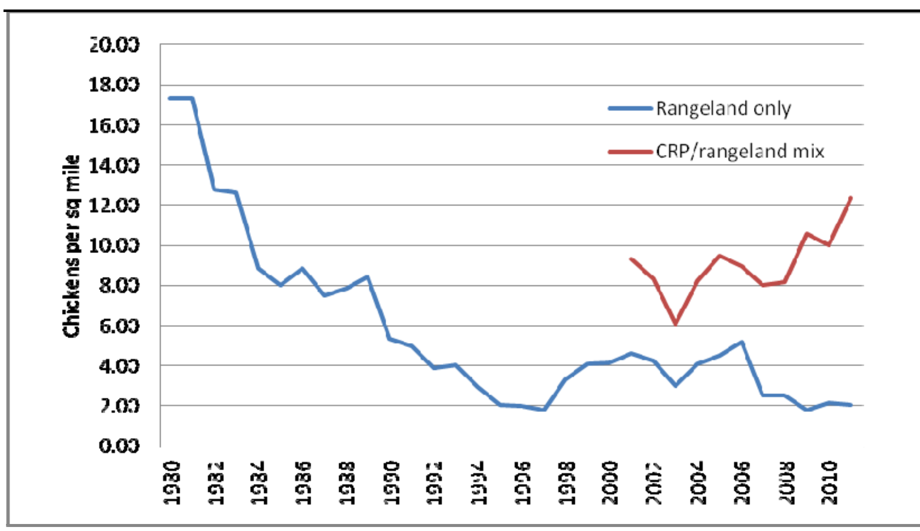


Figure 10. Lesser prairie-chicken response to CRP in Kansas

To assess the impact that CRP enrollment has on wildlife habitat, we identify the amount of CRP land that lies within areas used by species of generally recognized value. We consider the current ranges for sage-grouse and lesser prairie-chicken. Ducks are considered using continentally important waterfowl area data. Since imperiled ecosystems are associated with imperiled species, we account for other species by proxy by considering the historical extent of critically imperiled tallgrass prairie ecosystems. Tallgrass prairie may be the most endangered ecosystem in the United States, with approximately 1 percent of its original area (primarily in the Corn Belt) remaining (USFWS 1997).

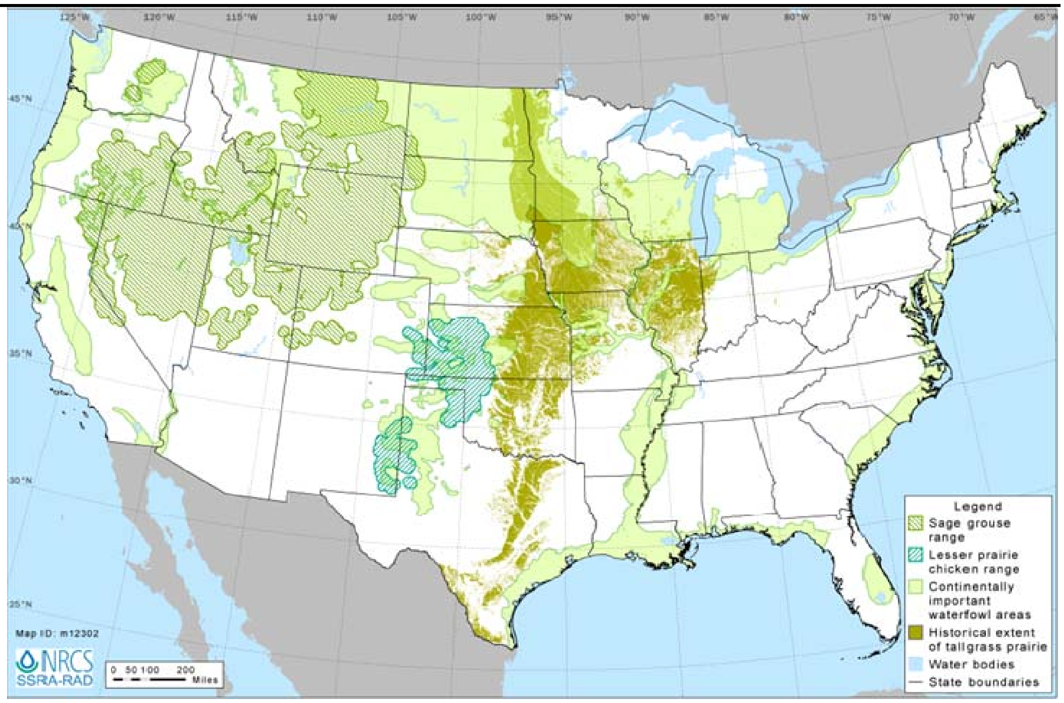
Figure 11 depicts the historical extent of the four areas that we consider to assess the relative wildlife impacts of CRP. Overall, 69 percent of CRP land (and 60 percent of the agriculturally most productive CRP enrollments) falls within at least one of these areas; table 2 provides the breakdown by specific area.

Cost to the Federal Government

The overall cost of CRP is significant: Outlays are projected to be $2 billion in fiscal year 2012, with an average outlay of $67 per acre assuming the current program size of 30 million acres. Costs are affected not only by the amount of land enrolled but also by which land is enrolled. The major cost dimensions for CRP are foregone crop production and Federal outlays. CRP annual payments are tied to county average soil rental rates, so variations in agronomic and economic conditions affect program costs.

In some cases, a return to crop production is more expensive to the Federal government than keeping the land in CRP. To analyze costs, average annual Federal payments

Figure 11. Select areas in which CRP is likely to provide important wildlife habitat



LANDFIRE 2009; NRCS 2011a; NRCS 2011b; USFWS 2011)

Table 2: Fraction of CRP land that falls within select areas associated with relatively high wildlife habitat values

	Percent of CRP land	
Indicator	All CRP	Top 20%
Sage-grouse range	8%	1%
Lesser prairie-chicken range	13%	0%
Continentally important waterfowl areas*	51%	36%
Tallgrass Prairie	14%	35%
Any of the four high value habitats	69%	60%

The criteria used to identify continentally important waterfowl areas varied by region, with some, including the Prairie Pothole Region, associated with larger areas and lower waterfowl densities than others. The overall spatial extent of these areas is likely to fall as more precise criteria are applied on a national basis.

and subsidies per acre associated with production agriculture are subtracted from CRP county-average annual payment rates to calculate a "net" CRP annual payment.[13] The payments associated with crop production include crop insurance premium subsidies, Direct and Countercyclical Payments, Average Crop Revenue Election Program (ACRE), marketing loan benefits, Supplemental Revenue Assistance Payments Program (SURE), disaster relief, and the non-livestock portion of Environmental Quality Incentive Payments (EQIP). Because Federal payments vary by year (disaster relief, in particular), a 5-year average (2006-2010) was calculated and compared to CRP county-average annual payments in 2008.

Figure 12 depicts the net CRP annual payment for all counties. Net payments tend to be low in the Southeast as a result of relatively high disaster payments and in the northern Great Plains as a result of relatively high crop insurance subsidies and disaster payments. The net payments tend to be higher in the very productive Corn Belt region. There are 569 counties in which average outlays per acre under the without-CRP scenario exceed CRP annual payments.[14] These counties are likely to include CRP enrollments that generate both environmental services and a net savings to the taxpayer.

[13] Establishment cost share is not considered because the analysis pertains to land already enrolled in CRP.

[14] Municipalities may also incur additional costs associated with increased nutrient and sediment loads from CRP land reverting to production agriculture, such as for drinking water treatment.

Conclusions

While the indicators used in this report are not comprehensive, they do affirm that the program generates considerable soil health, carbon sequestration, water quality, wildlife habitat, and other ecosystem benefits. The EBI ranking process for the General Signup CRP and the eligibility criteria for the Continuous Signup CRP help target enrollments to where the impacts are greatest. As improved indicators are developed and used to target and select offers for CRP enrollment, the CRP benefits per dollar invested are expected to increase.

Although returning CRP land to crop production may help satisfy agricultural demand, it has consequences. Most acres enrolled in CRP generate more environmental services than they would as working cropland. As indicated by the figures above, the adverse environmental impacts of a return to crop production vary by acre and depend on whether appropriate conservation practices are adopted and perform as intended. Impacts for some services, such as carbon sequestration and wildlife habitat, may also vary according to the duration of enrollment.

For the soil health, water quality, and aquifer recharge indicators used in this analysis, we estimate that 76 percent of General Signup CRP land would generate excessive impacts if returned to crop production. This fraction should be regarded as a lower bound because it pertains solely to the types of impacts for which suitable indicators and criteria exist. Whether and where other soil health, water quality, and aquifer recharge impacts are excessive is beyond the

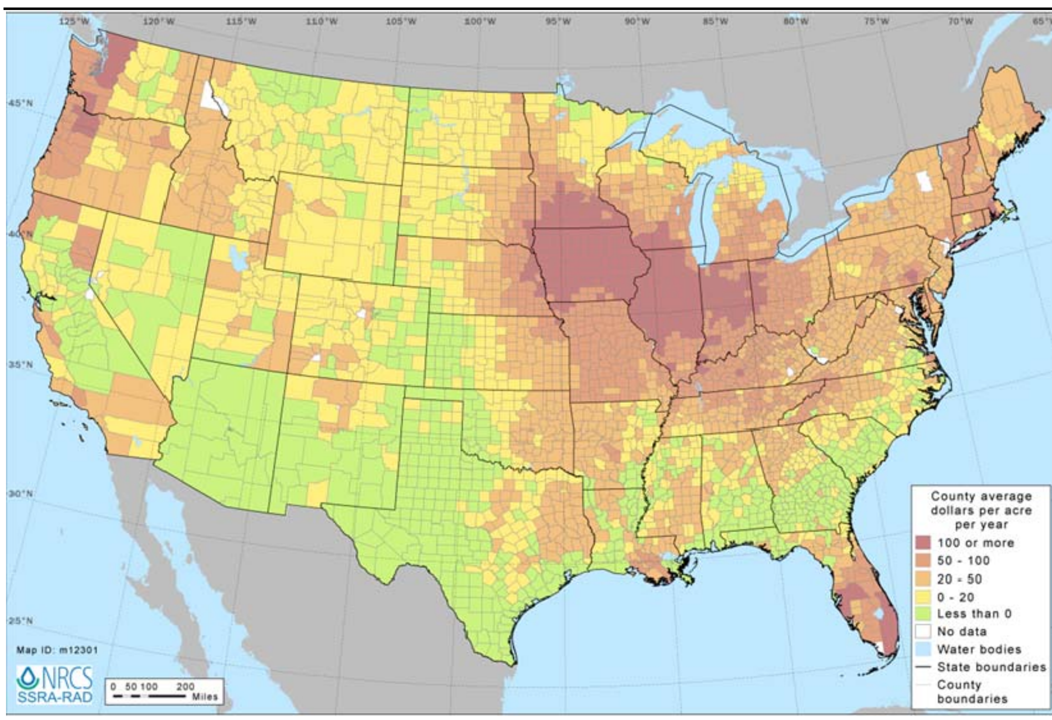


Figure 12. CRP annual payments net of production agriculture program support

scope of the analysis,[15] and likewise for additional carbon sequestration and wildlife habitat impacts. Table 3 provides the fraction of CRP land that exceeds at least one criterion by major water resource region.

The literature reports generally positive impacts of CRP on wildlife habitat, particularly when appropriate cover has been planted. Returning CRP land to crop production is likely to adversely impact wildlife habitat. In an attempt to identify a portion of CRP land that generates relatively large wildlife habitat benefits, we estimate that 69 percent of CRP land to fall within at least one of four critical habitat areas used in this analysis. While this analysis only specifically considers a select set of species and ecosystems, and assumes that CRP land satisfies habitat requirements for relevant species, it does offer a point of departure for identifying relative habitat impacts of CRP land.

While relatively productive CRP land is a likely candidate for leaving the program, caution is warranted because the adverse impacts of returning it to production may be disproportionately high. These enrollments would lose more soil organic carbon during conversion to cultivated cropland than would average CRP land, and would be more prone to add excessive sediment, nitrogen, and phosphorus loadings to water bodies. Perhaps due to favorable soil site characteristics, the 20 percent of CRP land with the highest potential crop productivity would still, on average, accumulate soil organic carbon when returned to working cropland, albeit more slowly than if left in CRP. The fraction we identify as critical wildlife habitat is also slightly less than for CRP as a whole.

[15] We do not calculate the union of the 76 percent of acres with excessive impacts when returned to crop production and the 69 percent of acres in critical wildlife habitat areas because of the difference in analytical approaches.

Table 3: Fraction of CRP land that exceeds at least one soil health, water quality, or water availability criterion if cropped

Region	% CRP land
Arkansas-White East	84%
Arkansas-White West	82%
Great Lakes	58%
Lower Mississippi River Basin	96%
Mid-Atlantic-Northeast	79%
Missouri East	50%
Missouri West	87%
Ohio-Tennessee	81%
Pacific Northwest	72%
South Atlantic-Gulf	92%
Souris-Red-Rainy	43%
Texas-Gulf	95%
Upper Mississippi River Basin	67%
United States	76%

Some CRP enrollments may cost taxpayers less than if the land were used to grow crops, given support provided by a constellation of working lands programs, such as direct and countercyclical payments, disaster assistance, crop insurance premium subsidies, and EQIP cost share payments. We report 569 counties where this situation may be relatively common. Downsizing CRP may increase the potential for additional taxpayer costs to the degree to which crop prices fall and/or marginal lands are cropped, increasing payments from various programs.

Regardless of fluctuating CRP acreage caps, indicators and analytic methods such as those used here can help increase the cost effectiveness of the program by targeting for re-enrollment expiring CRP lands that offer the largest net benefits. In doing so, the environmental consequences of CRP land returning to production agriculture can be reduced. By the same token, land in crop production that generates excessive adverse impacts would make a good candidate for enrollment in CRP.

References

Allen, A.W., and M.W. Vandever. 2003, A national survey of Conservation Reserve Program (CRP) participants on environmental effects, wildlife issues, and vegetation management on program lands: Biological Science Report, USGS/BRD/BSR—2003-0001: U.S. Government Printing Office, Denver, CO, 51 p.

Guru, M., and J. Horne. 2000. *The Ogallala Aquifer*. Poteau Oklahoma: The Kerr Center for Sustainable Agriculture.

Herkert, James R. 2007. Conservation Reserve Program Benefits on Henslow's Sparrows Within the United States. Journal of Wildlife Management. Vol: 71(8). 2749-2751.

Haufler, J. B., editor. 2005. Fish and wildlife benefits to Farm Bill Conservation Programs: 2000-2005 update. The Wildlife Society Technical Review 05-2. 205 p.

Haufler, J. B., editor. 2007. Fish and wildlife Response to Farm Bill Conservation Practices. 2007. The Wildlife Society Technical Review 07-1. 113 p.

Kansas Department of Wildlife, Parks, and Tourism. 2011. Lesser Prairie-Chicken Indices in Kansas, 1980-2010.

LANDFIRE Data Access Tool (LFDAT) for ArcGIS 9.2-9.3 (version 2.2). 2009. Toney, Chris; Bramel, Jody; Anderson, John. National Interagency Fuels, Fire, & Vegetation Technology Transfer and USDA Forest Service Rocky Mountain Research Station. Available: www.niftt.gov.

NRCS. 2011. Lesser Prairie Chicken Initiative. http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/home/?&cid=nrcsdev11_023912

NRCS. 2011. Sage Grouse Initiative. http://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/programs/farmbill/initiatives/?&cid=steldevb1027671

Niemuth, Neal D., Frank R. Quamen, David E. Naugle, Ronald E. Reynolds, Michael E. Estey, and Terry L. Shaffer, 2007. " Benefits of the Conservation Reserve Program to Grassland Bird Populations in the Prairie Pothole Region of North Dakota and South Dakota" ". USFWS Report OS-IA-04000000-N34. 64 p. http://www.fsa.usda.gov/FSA/webapp?area=home&subject=ecpa&topic=nra

Nielson, Ryan M., Lyman L. McDonald, and Shay Howlin. 2007. Estimating response of ring-necked pheasant (Phasianus colchicus) to the Conservation Reserve Program . A Western EcoSystems Technology, Inc. Report Contract number 53-3151-5-8059. 55p. http://www.fsa.usda.gov/FSA/webapp?area=home&subject=ecpa&topic=nra

Playa Lakes Joint Venture. 2007. Effects of the Conservation Reserve Program on Priority Mixed-grass Prairie Birds. A Conservation Effects Assessment Project.

Playa Lakes Joint Venture. 2009. Effects of the Conservation Reserve Program on Priority Shortgrass Prairie Birds. A Conservation Effects Assessment Project.

Rao, Mahesh, and Zhiming Yang. 2010. Groundwater Impacts Due to Conservation Reserve Program in Texas County, Oklahoma. Applied Geography 30 (2010) 317–328.

Reynolds, Ronald E., Charles R. Loesch, Brian Wangler, and Terry L. Shaffer, 2007. Waterfowl Response to the Conservation Reserve Program and Swampbuster Provision In the Prairie Pothole Region, 1992–2004. USFWS Report 05-IA-04000000-N34. 90 p. http://www.fsa.usda.gov/FSA/webapp?area=home&subject=ecpa&topic=nra

Schroeder, Michael A. and W. Matthew Vander Haegen. 2006. Use of Conservation Reserve Program Fields by Greater Sage-Grouse and Other Shrubsteppe associated Wildlife in Washington State. Washington Department of Fish and Wildlife Report. 39 p. http://www.fsa.usda.gov/FSA/webapp?area=home&subject=ecpa&topic=nra

Singleton, L.C., K.O. Evans, L.W. Burger Jr., R. Hamrick, D. Godwin. 2010. Mississippi's Conservation Reserve Program. CP33-Habitat Buffers for Upland Birds. Mississippi Bird Monitoring and Evaluation Plan, Annual Report, 2006–2010. 28 pp.

U.S. Fish & Wildlife Service. 1997. Northern Tallgrass Prairie Habitat Preservation Area Draft Environmental Impact Statement. U.S. Fish & Wildlife Service, Region 3, Fort Snelling, Minnesota, USA.

U.S. Fish & Wildlife Service. 2011. Map identifying areas of continental significance to North American ducks, geese, and swans for the 2012 NAWMP Revision.

Wentworth, K.L., M.C. Brittingham, and A.M. Wilson, Conservation reserve enhancement program fields: Benefits for grassland and shrub-scrub species, Journal of Soil and Water Conservation. vol. 65, (no. 1): 50-60. 2010.