Current Compliance Mechanisms

Current compliance mechanisms include Wetland Conservation provisions—commonly known as Swampbuster—and Highly Erodible Land (HEL) Conservation provisions, which include provisions commonly referred to as Conservation Compliance and Sodbuster. Conservation Compliance generally refers to requirements that apply to HEL that was cropped before enactment of the 1985 Food Security Act (FSA). Sodbuster refers to compliance requirements on HEL converted to crop production after 1985.

Compliance Objectives and Standards

The objectives of the **Highly Erodible Land Conservation** provision are to maintain soil productivity by maintaining soil depth and to reduce offsite damages due to sediment loads, e.g., to reduce sediment delivered to water bodies.

After the 1985 FSA, compliance implementation efforts focused on reducing erosion to the soil loss tolerance ("T") level. Developed largely in the 1940s and 1950s, T values were designed to represent the maximum rate of soil erosion consistent with maintaining a given level of soil productivity indefinitely. Before Conservation Compliance plans were devised and implemented on farms, however, several factors prompted movement away from the T standard. First, there were unresolved questions about the scientific validity of the T value. By the 1970s, the scientific basis for T values was widely recognized as weak, yet efforts to adjust T values to reflect higher erosion loss tolerance in some soils were unsuccessful (Cook, 1982). Alternate methods of assessing the potential for erosion productivity damage had been developed (see Pierce et al.) but were not used by USDA in establishing compliance requirements. Second, it became apparent that reducing soil erosion to the T level would be costly on some soils. By 1987, USDA had determined that reducing erosion to T or even 2T might be so costly that crop production would no longer be profitable on a great deal of highly erodible land (Canning, 1994). Finally, policymakers increasingly recognized the offsite damage associated with sediment (which is unrelated to T). Offsite damages can be substantial and are often larger than onsite damages (see Ribaudo, 1989; Ribaudo et al., 1990; Feather et al., 1999).

Ultimately, Conservation Compliance was implemented to consider both soil erosion and the cost of erosion reduction, without a fixed erosion standard. Where erosion could be reduced to the T level without making crop production unprofitable, producers were required to develop "basic" conservation plans (which reduce erosion to T). Where reducing erosion to T was more costly, producers were allowed to develop "alternative" conservation systems. Alternative conservation systems require the application of soil conservation practices that are technically and economically feasible in a given local area and achieve "significant" erosion reduction. However, producers are not required to reduce erosion to T or any other specific level. Some alternative systems allowed erosion to remain at 2T or even higher levels.

This focus on local conditions and site-by-site development of conservation plans allowed conservation systems to be tailored to climate, soils, cropping patterns, and the producer's management skills, leading to a broad array of

approved conservation systems. USDA data show that more than 1,600 distinct conservation systems have been approved. Although 51 percent use only conservation cropping sequences, conservation tillage, crop residue use, or some combination of these three practices (table 1), this flexibility probably resulted in more erosion reduction per dollar of cost than could have been achieved using a more prescriptive approach that relied on a few standard practices.

The use of alternative conservation systems is limited to HEL that was cropped during 1981-85. On HEL not previously cropped—i.e., sodbusted land—producers must use conservation systems that hold erosion to T, regardless of cost. In 1996, USDA tightened standards for alternative conservation systems developed after July 3, 1996. First, alternative systems must reduce erosion by at least 75 percent of potential erosion[4] and planned erosion cannot exceed 2T (USDA-NRCS, 1996). An exception is made for land returning to crop production from the Conservation Reserve Program (CRP), where compliance requirements cannot exceed those in force when the land entered the CRP. Second, for HEL not cropped during 1981-85, conservation systems must hold soil erosion to no more than the soil loss tolerance level (T) *and* prevent a "substantial increase" in erosion, defined as 25 percent of potential erosion (USDA-NRCS, 1996).

[4]Potential erosion is defined as inherent erodibility as calculated by the Universal Soil Loss Equation and Wind Erosion Equation.

Wetland Conservation provisions, widely known as Swampbuster, are designed to protect wetland functions and values by preserving existing wetlands.[5] Wetland values and functions include wildlife habitat, water purification, groundwater recharge, and mitigation of flood peaks.

[5]See regulations implementing Swampbuster, 7 CFR 12, 61 FR 47019.

To comply with Swampbuster, producers must refrain from altering wetlands to make agricultural production possible. In keeping with the focus on wetland functions and values, however, the 1996 Federal Agriculture Improvement and Reform (FAIR) Act allows some flexibility to alter some small areas of wetland if certain conditions are met. Producers are exempted from the sanction if:

- wetland conversion will have a minimal effect on overall wetland functions and values;

Table 1—Conservation management systems and practices applied on HEL cropland subject to compliance, 1997

Item	Percent of cultivated HEL
Conservation management systems	
Conservation cropping/crop residue use	27.5
Conservation cropping/conservation tillage	10.8
Conservation cropping only	7.8
Crop residue use only	4.9
Total	51.0
Conservation practices*	
Total with conservation cropping	81.1
Total with crop residue use	51.3
Total with conservation tillage	33.0

*Percentages sum to more than 100 because some conservation systems require the application of more than one practice.
Source: USDA, ERS, compiled from NRCS 1997 Status Review of Conservation Compliance data.

- the wetland conversion project is fully mitigated through creation or restoration of similar wetlands in the same general area;
- the action is permitted under the Clean Water Act *and* the Natural Resources Conservation Service (NRCS) determines that mitigation requirements are adequate; or
- a wetland is inadvertently altered without intent to violate the law and the wetland is restored within 1 year.

Programs and Payments Subject to Compliance

Producers who violate compliance requirements may be denied benefits from a wide range of Federal agricultural programs. Ongoing commodity and disaster programs make up the large majority of direct payments subject to compliance, accounting for 92 percent of these payments in fiscal year (FY) 2000, 90 percent in FY 2001, and 79 percent in FY 2002 (table 2). The 2002 Farm Security and Rural Investment (FSRI) Act will extend similar payments, in similar amounts, to a slightly broader group of producers (see box, "Farm Programs in the 2002 Farm Act: Will Compliance Be Affected?"). Conservation payments are also significant, including the Conservation Reserve Program (CRP), Wetland Reserve Program (WRP), Environmental Quality Incentives Program (EQIP), Emergency Conservation Program (ECP), and the Watershed Protection and Flood Prevention Program. Conservation program spending is authorized to expand by 80 percent over the life of the 2002 FSRI Act.[6] Federally subsidized crop insurance, which could be withheld under the original compliance provisions enacted in 1985, was removed from the list of programs

[6]For more details, see the ERS Farm Bill side-by-side comparison of 1996-2001 farm policy and the 2002 FSRI Act, http://www.ers.usda.gov/Features/FarmBill/Titles/TitleIIConservation.htm

Table 2—Direct payments subject to Wetland and/or HEL conservation provisions

	FY1997 actual	FY1998 actual	FY1999 actual	FY2000 actual	FY2001 actual	FY2002 actual
			Million $			
Ongoing commodity programs						
Production Flexibility Contract	6,350	5,719	5,476	5,057	4,105	3,968
Loan Deficiency	0	0	3,360	6,419	5,293	5,345
Other direct payments*	0	0	277	1	1,159	182
Subtotal--Commodity programs	6,350	5,719	9,113	11,477	10,557	9,495
Disaster programs						
Market Loss Assistance	0	0	3,011	12,436	5,455	0
Noninsured Disaster	63	69	54	38	64	181
Disaster	48	15	2,264	1,452	3,146	254
Subtotal--Disaster	111	84	5,329	13,926	8,665	435
Conservation programs						
Conservation Reserve Program	1,774	1,798	1,462	1,513	1,655	1,785
Environmental Quality Incentives Program	200	200	170	170	163	313
Wetland Reserve Program	119	219	123	165	182	263
Emergency Conservation Program	25	29	28	50	80	0
Watershed Protection and Flood Prevention	90	106	194	176	102	200
Subtotal--Conservation	2,208	2,352	1,977	2,074	2,182	2,561
Total	8,669	8,155	16,419	27,477	21,404	12,491

* Includes cotton user marketing payments and other direct payments.

Source: ERS, based on data from the Office of Budget and Program Analysis, USDA, the Highly Erodible Land and Wetland Conservation final rule (7 CFR 12, 61 FR 47019), and communications with national program staff, Farm Service Agency, USDA.

Farm Programs in the 2002 Farm Bill: Will Compliance Be Affected?

Compliance requirements are continued in the 2002 Farm Security and Rural Investment (FSRI) Act with only minor, technical changes. Changes in commodity and conservation programs, however, may affect producers' incentives to participate in Federal farm programs and, therefore, meet compliance requirements.

Spending on commodity and conservation programs is projected to increase by 80 percent (compared with continuing current programs), according to Congressional Budget Office (CBO) estimates. However, much of the increase in commodity program spending will replace ad hoc "market loss assistance" payments provided to producers annually by Congress for the 1998-2001 seasons. Thus, a majority of new funds authorized directly in the FSRI Act will go to producers of traditional program crops: corn, wheat, cotton, rice, sorghum, oats, and barley. Ad hoc disaster assistance, which has been authorized by Congress frequently in recent years, may be distributed somewhat differently, but is likely to augment commodity program spending mandated by the 2002 FSRI Act.

A modest amount of new spending will be used to extend commodity program payments to crops not previously eligible for these subsidies. For the first time, producers of soybeans, other oilseeds, and peanuts will be eligible for direct payments. Soybean and other oilseed producers were already eligible for price support loans. Price support loans will also be extended to producers of peanuts, wool, mohair, honey, small chickpeas, lentils, and dry peas. Whether these program extensions will expand the reach of compliance depends on (1) the acreage devoted to these crops and (2) whether farms producing them are already subject to compliance through production of other program crops.

Analysis of Agricultural Resource Management Survey (ARMS) data in conjunction with the National Resources Inventory (NRI) indicates that peanuts, wool, mohair, honey, small chickpeas, lentils, and dry peas are produced by more than 35,000 farms that encompass more than 8 million acres of highly erodible cropland. Nearly all of these farms, however, already receive Federal farm program payments based on other crops. We estimate that fewer than 5,000 farms encompassing less than 500,000 highly erodible cropland acres could come under compliance requirements for the first time. Thus, program expansion can be expected to have little, if any, effect on the reach or overall effectiveness of conservation compliance (or other compliance mechanisms).

Conservation program spending is also projected to increase by 80 percent. Over the 6-year life of the 2002 FSRI Act, the CBO projects conservation spending of $20.9 billion. The largest increases are for "working land" conservation programs, i.e., programs that support good conservation practices on land in agricultural production. Key working land programs include the Environmental Quality Incentives Program (EQIP) and the newly formulated Conservation Security Program (CSP). Authorized funding was also increased for the Conservation Reserve Program (CRP), Wetland Reserve Program (WRP), and a range of other conservation and environmental programs. Because these programs are open to all producers—not just producers of certain crops—and can address a wide range of agri-environmental problems, the extent to which expansion of these programs could extend compliance requirements is unknown.

subject to compliance in the 1996 Act and is not currently subject to compliance requirements.

Eligibility for Federal agriculture-related loans or loan guarantees (e.g., price support loans and farm credit loans) can also be denied (table 3). Unlike direct payments, the actual benefit received by producers is less than that indicated by the program level. While the program level is the total amount available for direct loans or loan guarantees, most direct loans and loans covered by a guarantee are, in fact, repaid. Producer subsidies come in the form of lower interest rates than would otherwise be available. For example, direct government loans (e.g., price support loans) are often provided at rates lower than are commercially available. Other loan and loan guarantee programs provide credit or assistance in obtaining credit for farmers who cannot afford commercially available credit.

The effectiveness of compliance depends critically on the spatial distribution of payments relative to the environmental problems addressed through compliance mechanisms. Figure 1 shows the spatial distribution of key commodity program payments for the 1998 crop year: Production Flexibility Contract (PFC) payments, Market Loss Assistance (MLA) payments, and Loan Deficiency Payments (LDPs).[7] These payments are concentrated in the Corn Belt, the Plains States, and the Mississippi Delta—areas that account for roughly two-thirds of U.S. cropland. Although the total amount of these payments has varied from year to year, we assume that the spatial distribution of these payments does not change significantly from year to year because it depends largely on the spatial distribution of base acres.[8] Our assumption is consistent with the USDA baseline, which assumes ongoing funding for income support tied to base acreage. Ad hoc disaster payments, approved by Congress on an annual basis, could shift the distribution of overall payments if a significant share of ad hoc payments goes to farmers who are not clients of the traditional farm commodity programs. Recent history suggests, however, that these payments will augment, not replace, more traditional farm income support payments.

[7]Loan Deficiency Payments and Market Loss Assistance payments associated with the 1998 crop were made largely during FY 1999.

[8]Base acres are the land that is eligible for income support payments through Federal farm commodity programs. Base acreage is determined by historical plantings, and does not depend on current crop acreages.

Table 3—Government loan programs subject to Wetland and/or HEL conservation provisions

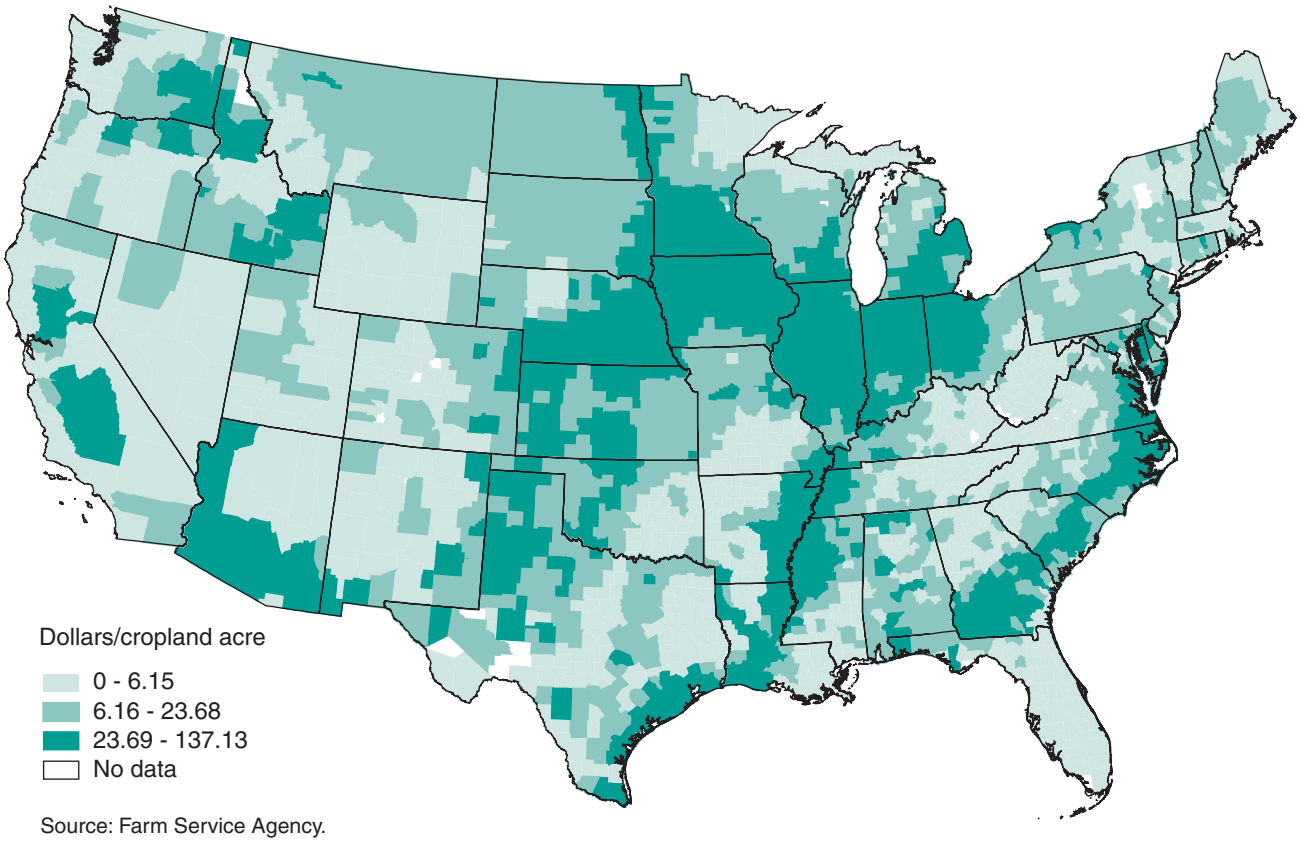
	FY1999	FY2000	FY2001
		Million $	
Commodity loan programs			
Price support/Marketing asst. loans	8,358	9,669	8,567
Farm storage facility loans*	0	102	81
Total--Commodity loan programs	8,358	9,771	8,648
Farm credit loan programs			
Farm operating loans	2,565	2,465	2,153
Farm ownership loans	944	1,106	1,016
Emergency loans	330	151	90
Total--Farm credit loan programs	3,839	3,722	3,259
Total--Loan programs	12,197	13,493	11,907

*Not subject to Wetland Conservation provisions.

Source: ERS, based on data from the Office of Budget and Program Analysis, USDA, the Highly Erodible Land and Wetland Conservation final rule (7 CFR 12, 61 FR 47019), and communications with national program staff, Farm Service Agency, USDA.

Figure 1

Distribution of commodity program payments, 1998



Source: Farm Service Agency.

Analysis of Conservation Compliance

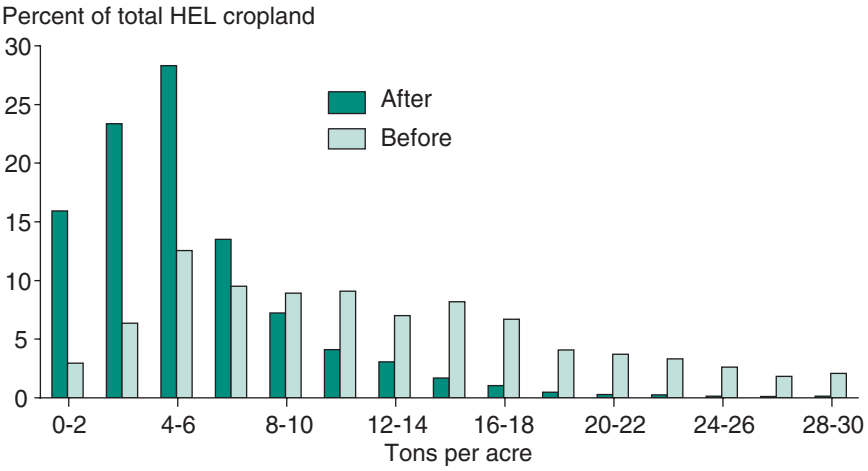
According to USDA's annual Conservation Compliance Status Review (CSR), overall compliance with Conservation Compliance provisions is high. Based on the 1997 CSR data (the year matching the most recent National Resources Inventory, which we use extensively in the analysis that follows), 95.9 percent of producers subject to compliance were actively applying approved conservation systems. In more recent years, the CSR has shown compliance rates of roughly 98 percent. The 1997 data also indicate that the distribution of HEL cropland by erosion rate has shifted dramatically to lower erosion rates (fig. 2). In other words, the rate of soil erosion has declined significantly on most HEL cropland acres subject to compliance.

A recent General Accounting Office (GAO) study, however, identifies deficiencies in the CSR that cast some doubt on NRCS compliance estimates (see box, "Enforcement: The Compliance Status Review"). GAO criticized the CSR on the selection of the review sample, a lack of consistency and clarity in the guidance provided to local offices, data handling and analysis, failure to cite producers for significant deficiencies, and inadequate justification for waiver of penalties.

We take an alternate approach, using existing datasets not created for the express purpose of evaluating compliance mechanisms in an attempt to determine the overall effectiveness of compliance in reducing erosion on HEL

Figure 2

Distribution of highly erodible cropland subject to compliance by soil erosion rate before and after Conservation Compliance, 1997



Source: ERS analysis of 1997 Compliance Status Review.

cropland. It is clear that erosion has been reduced on land subject to compliance—even if the magnitude of those reductions is somewhat in doubt. Even so, a broader look at soil erosion reduction provides context for evaluating the overall role of Conservation Compliance in achieving those reductions. Specifically, what is the extent of erosion reduction that can be directly attributed to Conservation Compliance? Has soil erosion been reduced more on land subject to compliance than on land not subject to compliance?

We analyze these questions using a two-step process. First, we analyze overall erosion reduction using data from the 1997 and previous National Resources Inventories (NRI). (See box, "Conservation Compliance and NRI Point Data"). The NRI contains data on HEL cropland and changes in annual erosion over time but, with the exception of the Conservation Reserve Program (CRP), do not specify whether a specific tract is enrolled in a government program. We use NRI data to estimate the amount of erosion reduction that *could be* directly attributed to compliance, *if* it occurred on land in a farm receiving payments subject to compliance. In other words, we believe that reduction in "excess" erosion (erosion exceeding T) on HEL that was cropped in both 1982 and 1997, *if* it occurred on a farm receiving payments subject to compliance, is the best estimate of erosion reduction that could be directly attributed to Conservation Compliance. We exclude erosion reduction below the T level on HEL cropland because it was not required by Conservation Compliance. We note, however, that the discrete nature of conservation practices may have resulted in the development of Conservation Compliance systems with erosion rates of less than T. Moreover, because compliance requirements were designed to allow HEL cropland to remain in crop production, we exclude erosion reduction due to land-use change. No erosion reduction would have been required on HEL cropland with a pre-compliance erosion rate equal to or less than T. Erosion reduction on non-HEL cropland is clearly not subject to compliance.

Enforcement: The Compliance Status Review

The Food Security Act Compliance Status Review (CSR) is USDA's primary mechanism for enforcement of Highly Erodible Land Conservation (HELC) and Wetland Conservation (WC) provisions. Each year, through the CSR, USDA field staff assess HEL and wetland compliance on a sample of tracts that are identified as part of farms receiving Federal farm program payments subject to HELC or WC provisions. Some tracts are selected at random from USDA's Farm Service Agency (FSA) database while others are added by State FSA offices because of potential for noncompliance. For example, tracts on which temporary variances or waivers were previously granted must be checked to establish a return to full compliance.

In 2001, a total of 17,723 tracts were reviewed, including about 4.9 million acres (from NRI we estimate that there are about 330 million acres of cropland and 104 million acres of HEL cropland). Of the total tracts, 13,552 were identified through random sampling of the national database, while 4,171 were added by States. The CSR summary prepared by the Natural Resources Conservation Service (NRCS) shows 98 percent of reviewed tracts and 98.9 percent of reviewed acres in compliance with HELC requirements. Of that total, roughly 3 percent were in compliance, but were complying with a variance, condition, or exception. For example, variances can be granted for personal hardship or unusual weather-related factors that made it impossible to carry out the plan. Potential WC violations were found in 0.7 percent of tracts reviewed. These results are consistent with previous compliance reviews that showed HELC compliance of 97-98 percent.

A recent General Accounting Office (GAO) report, *Agricultural Conservation: USDA Needs to Better Ensure Protection of Highly Erodible Croplands and Wetlands*, identified a variety of deficiencies in the CSR that "make questionable USDA's claim that 98 percent of the Nation's cropland tracts subject to the conservation provisions are in compliance" (U.S. General Accounting Office, 2003). GAO criticized USDA's CSR on a variety of issues, including methods used to select the review sample, consistency and clarity of guidance provided to local offices, data handling and analysis, failure to cite producers for significant deficiencies, and inadequate justification for waiver of penalties.

For example, one issue raised by the GAO report is the inclusion in the CSR of many tracts that do not require a compliance plan. In the 2001 CSR, 33 percent of the tracts reviewed did not require conservation plans. Often, these tracts were permanent pasture or rangeland, yet these tracts are included as in compliance with HELC and WC provisions. If these tracts are removed from the CSR data, the overall compliance rate drops to 92.8 percent.

Deficiencies in the CSR identified by GAO do not necessarily imply that HELC provisions have been ineffective in reducing soil erosion on highly erodible cropland. Even if better enforcement could increase erosion reductions and associated environmental benefits, erosion reductions due to compliance may have been significant. The uncertainty suggests the importance of improved evaluation of conservation compliance.

Second, we combine NRI data with data on farms whose operators responded to the 1997 Agricultural Resource Management Survey (ARMS). Combining these data sets allows us to:

- gauge the proportion of HEL cropland located on farms that receive payments subject to compliance;
- estimate the distribution of payments over HEL cropland acres; and
- calculate the reduction in excess erosion (erosion exceeding T) on HEL that was cropped in both 1982 and 1997 on farms with and without government payments.

Reduction in excess erosion on HEL cropped in 1982 and 1997 that is located on farms with payments is our estimate of erosion reduction that *could be* directly attributed to compliance. Other factors, such as technical change, may have also played a role.

Erosion Reduction, 1982-1997

The 1985 FSA required development of Conservation Compliance plans by 1990 and full implementation by 1995. Between 1982 and 1997, annual cropland erosion declined by 1.174 billion tons per year, a reduction of

Compliance Requirements and NRI Point Data

The National Resources Inventory (NRI) is a sample of roughly 1.3 million points of land throughout the United States. For each point, NRI provides a wealth of data on land use and land condition. Typically, the NRI contains data for three points of land within each primary sampling unit (PSU), which is usually a 40-acre tract. Because the characteristics of land vary continuously, sampling at discrete points allows single-valued measures of land use, soil type, topography, etc. When appropriately weighted, the point data can be aggregated to produce estimates of land use, soil erosion, etc.

Compliance requirements, however, are determined on a field-by-field basis. To be subject to compliance, a field must be made up predominately of highly erodible soils. If a field is designated as highly erodible land (HEL), conservation requirements apply to the entire field, not just the highly erodible portion of the field. Field boundaries are carefully defined to make it difficult for producers to redefine fields to avoid compliance requirements.

Using point-based data from NRI to analyze a field-based program like Conservation Compliance may lead to some estimation errors. Some NRI points of HEL may fall in fields that are not predominately HEL and, therefore, not subject to compliance requirements. Any reduction in excess erosion at these points could be incorrectly included in our estimate of soil erosion reduction that could be attributed to Conservation Compliance. Likewise, NRI points of non-HEL land may be located in fields that are predominately HEL and, therefore, could be incorrectly excluded from our estimate of soil erosion that can be attributed to Conservation Compliance.

Because the spatial relationship between field boundaries and NRI points is unknown, it is impossible to accurately assess the level of error introduced by this difference in program implementation and data collection. The errors may, to some extent, offset one another because some points that should be included are excluded and vice versa.

Table 4—Erosion reduction on U.S. cropland between 1982 and 1997

Cropland type	Cropland erosion, 1982			Cropland erosion, 1997			Change in erosion due to		
	Water	Wind	Totals	Water	Wind	Totals	Water	Wind	Totals
				Million tons per year					
HEL									
Cropped in 1982 and 1997									
Excess erosion[1]	432.9	396.8	829.7	225.2	273.5	498.7	-207.7	-123.3	-331.0
Non-excess erosion	147.6	140.8	288.4	134.9	117.3	252.2	-12.7	-23.5	-36.2
Land-use change									
CRP[2]	114.8	175.2	290.0	0.0	0.0	0.0	-114.8	-175.2	-290.0
Non-CRP[3]	119.3	48.6	167.9	54.3	38.7	93.0	-65.0	-9.9	-74.9
Total, HEL	814.6	761.4	1,576.0	414.4	429.5	843.9	-400.2	-331.9	-732.1
Non-HEL									
Cropped in 1982 and 1997	737.1	540.8	1,277.9	611.8	386.7	998.5	-125.3	-154.1	-279.4
Land-use change									
CRP	62.1	47.8	109.9	0.0	0.0	0.0	-62.1	-47.8	-109.9
Non-CRP	74.7	22.0	96.7	29.5	14.2	43.7	-45.2	-7.8	-53.0
Total, non-HEL	873.9	610.6	1,484.5	641.3	400.9	1,042.2	-232.6	-209.7	-442.3
Total									
Cropped in 1982 and 1997	1,317.6	1,078.4	2,396.0	971.9	777.5	1,749.4	-345.7	-300.9	-646.6
Land-use change									
CRP	176.9	223.0	399.9	0.0	0.0	0.0	-176.9	-223.0	-399.9
Non-CRP	194.0	70.6	264.6	83.8	52.9	136.7	-110.2	-17.7	-127.9
Total, HEL and non-HEL	1,688.5	1,372.0	3,060.5	1,055.7	830.4	1,886.1	-632.8	-541.6	-1,174.4

[1]Excess erosion is equal to erosion less the soil loss tolerance or "T" value, or zero, whichever is larger.
[2]CRP erosion is minus 1982 erosion on land cropped in 1982 but in CRP in 1997.
[3]Non-CRP land-use change is 1997 erosion on land cropped in 1997 but not 1982, less 1982 erosion on land cropped in 1982 but not 1997.

Source: ERS analysis of NRI data

nearly 40 percent (table 4). Average annual wind and water erosion declined by 541.6 million tons and 632.8 million tons, respectively.

Erosion reductions that cannot be attributed directly to compliance account for erosion reductions of 843.4 million tons per year. These reductions in average annual erosion include 442.3 million tons on non-HEL cropland, 365 million tons due to land-use change (290 million tons due to CRP enrollment of HEL cropland, and 74.9 million tons due to a net movement of HEL land out of crop production[9]) and 36.2 million tons of "non-excess" erosion on HEL cropland (fig. 3).

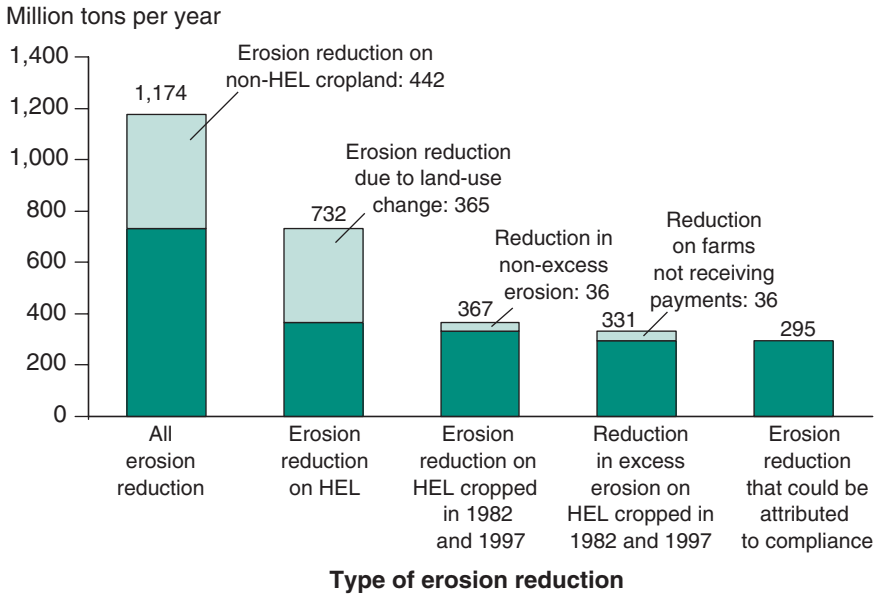
Reduction in excess erosion on HEL cropped in 1982 and 1997 was 331 million tons, 28.2 percent of all erosion reduction and 42.8 percent of all erosion reduction not associated with land retirement in CRP. More than 60 percent of this erosion reduction, 207.7 million tons per year, was excess erosion due to water while 123.3 million tons was excess erosion due to wind. The proportion of these reductions that occurred on farms receiving government payments—which we estimate in the following section—is our best estimate of erosion reduction that could be directly attributed to Conservation Compliance.

Some portion of other erosion reductions could be *indirectly* attributed to Conservation Compliance. Erosion reduction on some non-HEL cropland may be indirectly attributed to compliance if conservation systems were also adopted on non-HEL cropland within the complying farm. For example,

[9]While some HEL land was shifted into crop production, more was shifted out of crop production.

Figure 3

Erosion reduction and Conservation Compliance, 1982-97



Source: ERS analysis of 1997 NRI and 1997 ARMS data.

conservation tillage may have reduced costs for some producers, prompting its use on non-HEL cropland as well. Even though compliance requirements were designed to keep compliance costs low, some producers may have opted to convert land to grass or forest to avoid these costs. The extent to which these erosion reductions can be attributed to compliance is unknown.

There is also evidence to suggest Sodbuster sanctions may have deterred some producers from initiating crop production on HEL not previously cropped. Unlike Conservation Compliance, Sodbuster requires that producers apply basic conservation systems—which achieve the T standard—on previously uncropped land, regardless of cost. Claassen et al. (2000) show that, depending on the level of commodity price expectations, between 7 and 14 million HEL acres that were not cropped in 1992 are located near existing cropland and have inherent soil productivity high enough to make crop production profitable in the absence of Sodbuster.

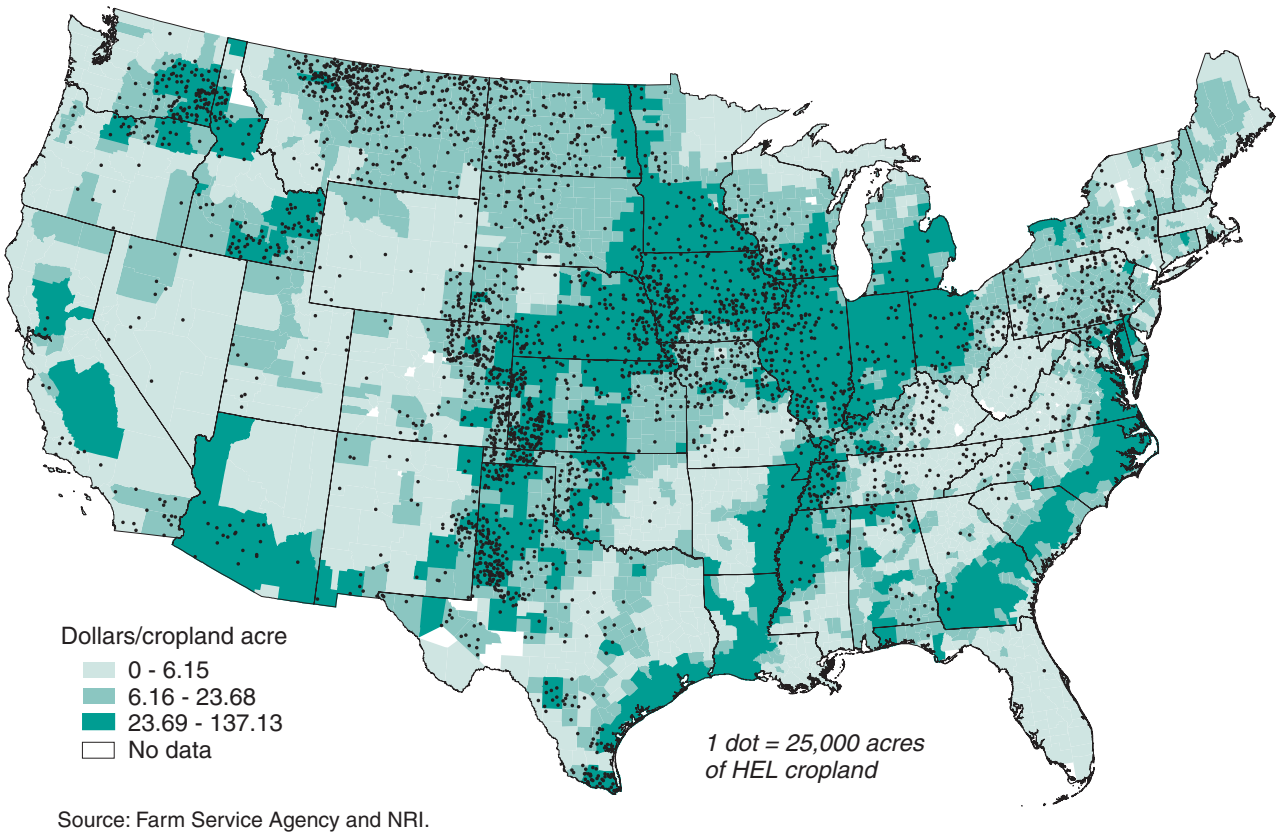
Erosion Reduction and Farm Program Participation

Soil erosion reduction that *could be* directly attributed to Conservation Compliance is the reduction in excess erosion on HEL that was cropped in both 1982 and 1997 (331 million tons) *and* is located on farms that receive government payments. A simple overlay of HEL cropland data with data on government payments suggests that most HEL cropland is located in areas with at least a moderate level of government payments (fig. 4). In this section, we go beyond the simple overlay to estimate the number of HEL acres on farms with and without government payments, as well as the reduction in excess erosion on farms with and without payments.

To provide an estimate of the overlap between farms receiving government payments and HEL cropland, we combined environmental and resource data

Figure 4

Distribution of commodity program payments and highly erodible cropland, 1998



Source: Farm Service Agency and NRI.

from the NRI with production and financial data (including data on government payments received) from ARMS (see Appendix 1). This analysis defines government payments as farm commodity program payments, disaster payments, and conservation payments from the CRP, WRP, and EQIP. These payments account for roughly 98 percent of direct payments potentially subject to compliance mechanisms. We use 1997 payments to match available environmental data from the 1997 NRI. Although total payments subject to compliance have been much higher in years since 1997, their spatial distribution has remained relatively constant over these years.

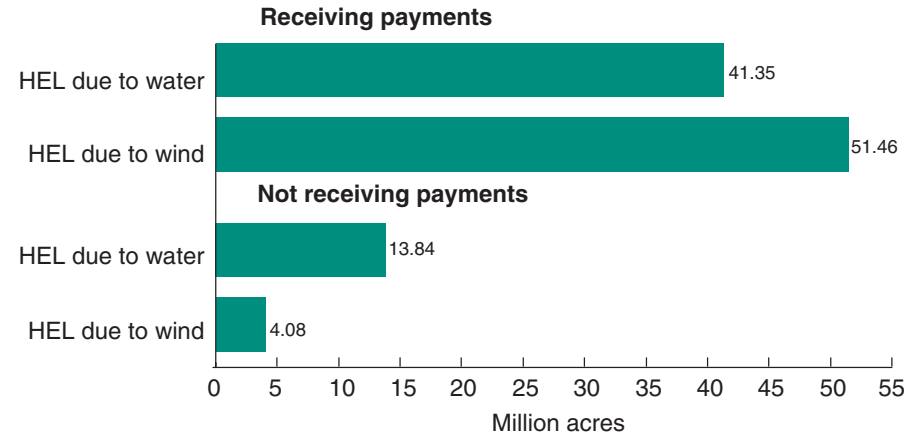
We estimate that more than 83 percent of HEL cropland is located on farms that receive farm commodity program, disaster, or conservation payments (fig. 5). Of cropland that is highly erodible due to wind, 92 percent is located on farms receiving payments, while about 75 percent of cropland that is highly erodible due to water is located on farms receiving payments. Results vary across regions[10] (fig. 6) and farm types (fig. 7). HEL cropland on farms not receiving payments is estimated to account for more than 50 percent of HEL acreage in only two regions—the Eastern Uplands and Southern Seaboard—regions with a high proportion of livestock-oriented farms. In other regions, 65-95 percent of HEL cropland is estimated to be located on farms that receive payments.

While the large majority of HEL cropland is located on farms receiving payments, payments are not distributed evenly across HEL acres. A large share of

[10]For ERS Farm Resource Regions, see figure 8.

Figure 5

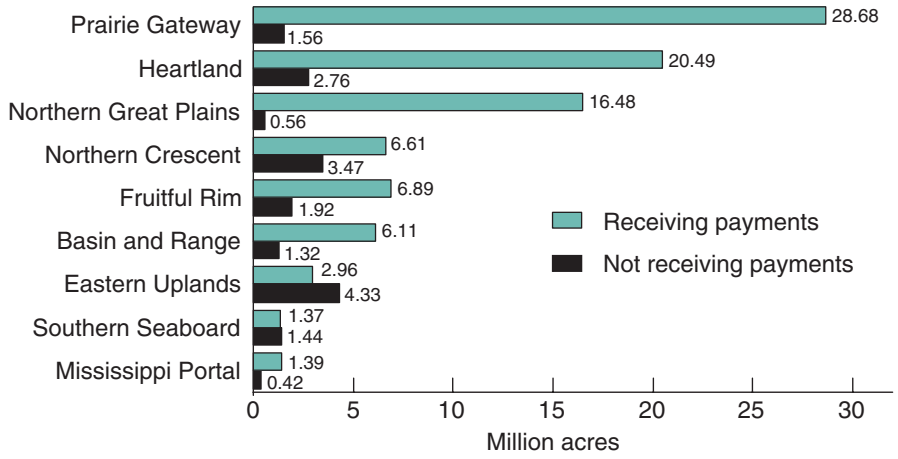
Highly erodible cropland acreage subject to Conservation Compliance on farms receiving and not receiving farm program payments, 1997



Source: ERS analysis of 1997 NRI and 1997 ARMS data.

Figure 6

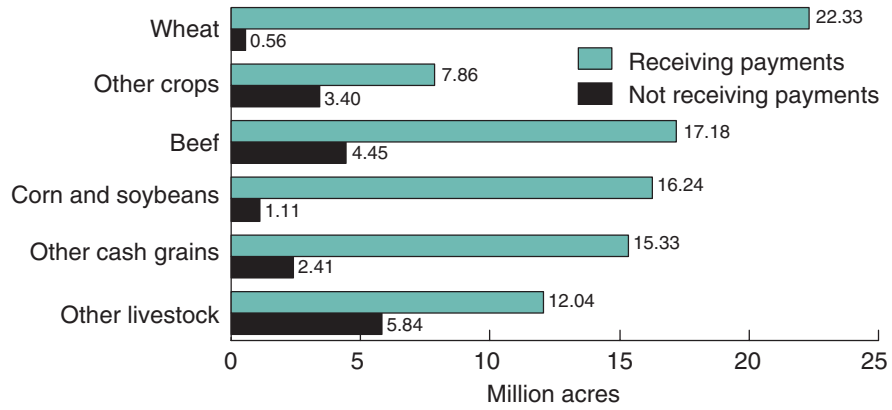
Highly erodible cropland on farms receiving and not receiving payments, by ERS Farm Resource Region, 1997



Source: ERS analysis of 1997 NRI and 1997 ARMS data.

Figure 7

Highly erodible cropland acres on farms receiving and not receiving payments, by commodity specialization, 1997



Source: ERS analysis of 1997 NRI and 1997 ARMS data.

payments go to farms that have little or no HEL cropland, while many farms with large acreage of HEL cropland receive relatively modest government payments. We estimate that roughly 28 percent of HEL cropland is located on farms that received total government payments of less than $15 per HEL acre in 1997, and nearly 50 percent is on farms that received less than $30 per HEL acre (fig. 9). Note, once again, that payments have been higher in more recent years (table 2). Low violation rates imply that most producers who received only modest payments are fulfilling Compliance requirements. If true, the net benefit of program participation to these producers exceeds the cost of compliance, whatever the level of payments per HEL acre.

We estimate that reduction in excess wind and water erosion on land cropped in both 1982 and 1997 has been larger on farms receiving payments than on farms not receiving payments (fig. 10). For wind erosion, the difference is large. Excess wind erosion declined by 30.7 percent on farms receiving payments while declining only 14.2 percent on farms not receiving payments. For water erosion, the difference is somewhat smaller. Excess water erosion dropped by 46.7 percent on HEL cropland on farms receiving payments while the decrease was 40.5 percent on farms not receiving payments. Overall, an erosion reduction of 294.6 million tons per year could be directly attributed to Conservation Compliance—about 89 percent of the 331 million tons of excess erosion reduction on HEL cropland cropped in 1982 and 1997 and 25 percent of all erosion reduction (fig. 3).

In summary, cropland erosion reduction between 1982 and 1997 was widespread. Erosion was reduced on land that is clearly not subject to compliance (e.g., non-HEL cropland) as well as land that probably is. About 89 percent of the reduction in excess erosion on HEL cropped in both 1982 and 1997—land subject to compliance—occurred on farms receiving payments, which accounted for roughly 83 percent of all HEL cropland. The difference was much greater for wind-erodible soils than for water-erodible soils. Substantial water quality, air quality, and soil productivity benefits are likely to have resulted from these erosion reductions (Canning, 1994; Hyberg, 1997).

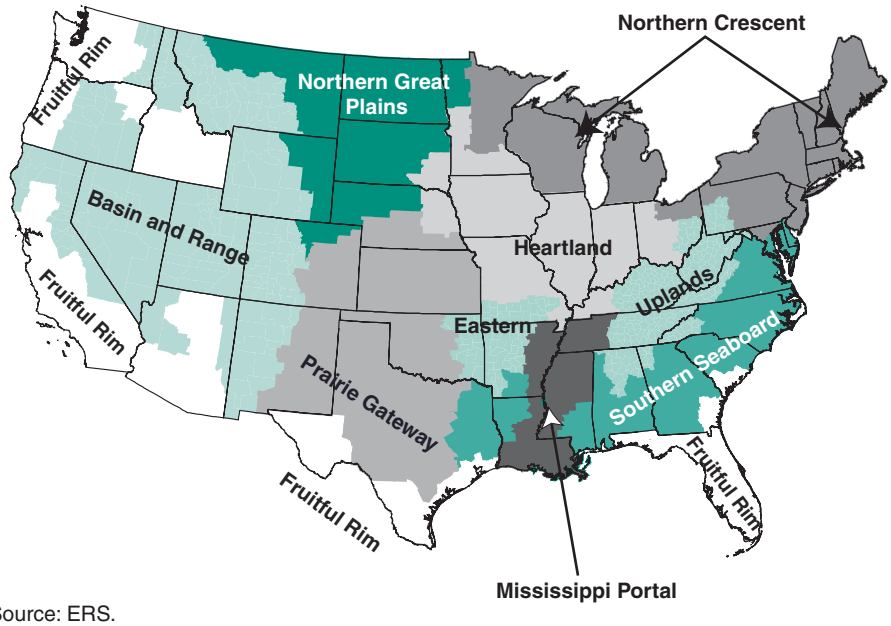
Compliance Costs

The above analysis suggests that many producers are in compliance even though program benefits per acre of HEL cropland are modest for some farms. This result is not surprising, because a flexible standard helped to keep costs low. The result also suggests that practices that are widely used in compliance systems are inexpensive. More than half of all conservation systems are some combination of conservation tillage, conservation cropping, and seasonal crop residue management.

Conservation tillage systems leave at least 30 percent of the soil surface covered with crop residue at planting time. While conservation tillage systems have the potential to reduce production costs, the evidence is mixed—labor, fuel, and capital costs may decline while herbicide or fertilizer costs may increase in many situations (Sandretto, 1997). Climate and soil conditions also play a role. Soils that are not tilled or tilled less may warm up and dry out more slowly than with conventional tillage. McBride (1999) notes that per-bushel cost advantages to conservation tillage in corn may be greatest in the

Figure 8

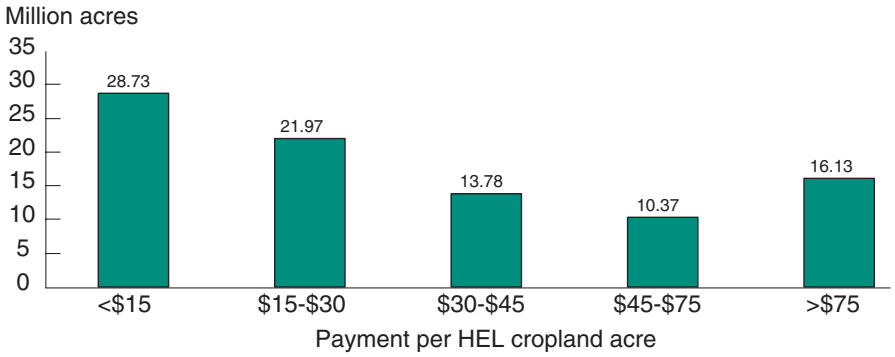
ERS Farm Resource Regions



Source: ERS.

Figure 9

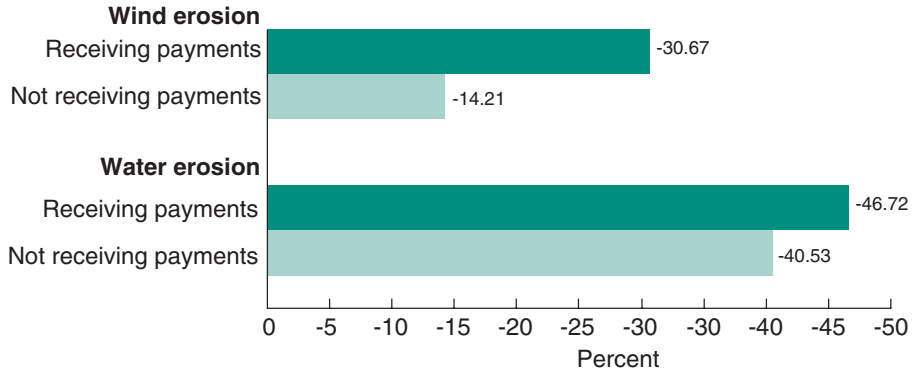
Highly erodible cropland acreage by payment per acre, 1997



Source: ERS analysis of 1997 NRI and 1997 ARMS data.

Figure 10

Percent change in excess erosion on highly erodible cropland on farms receiving and not receiving payments, 1982-97



Source: ERS analysis of 1997 NRI and 1997 ARMS data.

Plains States where reduced tillage can conserve moisture and help boost yields. Wet, cold conditions can lead to emergence problems and slow early-season plant growth, which can reduce yields (Griffith et al., 1988). *Seasonal crop residue management* differs from conservation tillage in that the seedbed is clean-tilled, but the previous year's crop residue is allowed to remain on the surface longer to protect the soil. Tillage costs are not reduced, but the period available for tillage is decreased, increasing the potential for delayed planting due to weather. *Conservation cropping* may include production of less profitable crops or the cost of establishing cover crops for a portion of the season.

One source of national data on the potential cost of conservation practices is the Environmental Quality Incentives Program (EQIP) database. EQIP payments do not directly represent estimates of cost. Payments indicate what some producers were *willing to accept* to implement land management conservation practices. Since EQIP is a voluntary program, we assume that payments cover at least the producer's cost, less any potential benefit that the producer can capture (e.g., lower fertilizer costs under nutrient management). For structural practices, such as filter strips, the payment is a cost-share (up to 75 percent in EQIP). For land management practices typical in Conservation Compliance systems, the EQIP payment could exceed producer costs. Incentive payments are provided for up to 3 years to smooth the transition to new production practices.

Nationally, the average incentive payment for producers adopting conservation cropping is $6.82 per acre annually for 3 years, and 95 percent of enrolled producers received $10.00 *or less* per acre annually for 3 years. Because incentive payments last only 3 years, we assume that the net present value of the payments covers the cost of practice adoption. Using a 4-percent rate of discount, the net present value (NPV) of 3 years worth of the average conservation cropping payment would be $18.92, while 95 percent of producers would receive payments with a NPV of less than $27.75 (table 5). For conservation tillage (not including no-till), the average incentive is $20.36 per acre (NPV over 3 years), while 95 percent of producers received $33.40 or less. EQIP participants adopting crop residue use techniques received $14.58 on average, and 95 percent received $27.75 or less.

Average payments for specific conservation practices vary regionally (table 6). The average NPV of EQIP incentive payments for conservation cropping ranges from $10.36 in the Prairie Gateway to $26.74 in the Southern Seaboard. For conservation tillage, the average incentive payment varies from $18.89 to $31.77, with the lowest payments in the Prairie Gateway (where moisture conservation is an issue, so that the private benefits of adopting conservation tillage may be highest) and the highest payments in the Eastern Uplands. Finally, for crop residue use, average NPV of EQIP payments range from $8.53 to $20.48.

The net present value of government payments that leverage Conservation Compliance is generally larger than these payments for conservation practice adoption. Among farm program participants with HEL cropland, two-thirds of HEL acres were on farms that received $15 *or more* in overall government payments per HEL acre in 1997 (fig. 9). The current farm bill extends payments for 6 years. Discounted at 4 percent, the NPV of a $15-

per-acre annual payment, made over a 6-year period, would be $78.75. Moreover, producers may expect that income support payments will be extended indefinitely. The NPV of a $15-per-acre annual payment over 20 years would be $204—more than enough to leverage the adoption of one or more conservation practices.

As expected, the cost of complying (as measured by willingness to accept EQIP payments) is generally lower than the benefits of farm program participation (the value of program payments). Actual costs are unlikely to be higher than producer willingness to accept but can be lower. These findings are consistent with a high rate of compliance. Low costs may also help explain the fact that, for the period analyzed, erosion reduction was widespread, occurring on land that is not subject to compliance, as well as land that is.

Analysis of Swampbuster

Unlike highly erodible land conservation, wetland conservation provisions interact significantly with both Federal and State regulatory requirements and apply largely to land that is not currently in crop production. We focus our analysis on the potential for wetland conversion without Swampbuster sanctions and on the implication of changing Federal wetland regulations.

Roughly 92 million acres of wetland are potentially subject to Swampbuster (Claassen et al., 1998). Between 1986 and 1997, a total of 26,597 acres of wetland were drained in violation of Swampbuster by 1,136 producers

Table 5—Average and 95th percentile EQIP incentive payments for selected conservation practices

Conservation practice	Average annual	95th percentile	3-year NPV of average annual	3-year NPV of 95th percentile	Number of contracts
	Dollars per acre				
Conservation cropping	6.82	10.00	18.92	27.75	3,386
No tillage	11.90	20.00	33.02	55.50	7,664
Conservation tillage*	7.34	12.04	20.36	33.40	3,523
Crop residue use	5.25	10.00	14.58	27.75	4,309

*Practice 329b, "Mulch Till" in the NRCS Field Office Technical Guide.

Source: ERS analysis of EQIP database (NRCS).

Table 6—Average EQIP incentive payments for selected conservation practices, by region

ERS Farm Resource Region	Average annual payment			Net present value over 3 years		
	Conservation cropping	Conservation tillage*	Residue mgmt. (seasonal)	Conservation cropping	Conservation tillage*	Residue mgmt. (seasonal)
			Dollars per acre			
Heartland	6.44	9.10	7.09	17.86	25.26	18.60
Northern Crescent	6.94	9.26	7.33	19.25	25.68	19.24
Northern Great Plains	5.13	10.88	4.98	14.23	30.18	13.08
Prairie Gateway	3.73	6.81	4.29	10.36	18.89	11.26
Eastern Uplands	8.84	11.45	7.56	24.53	31.77	19.85
Southern Seaboard	9.64	6.94	7.44	26.74	19.25	19.52
Fruitful Rim	7.16	8.32	7.80	19.87	23.10	20.48
Basin and Range	8.20	7.23	3.25	22.74	20.07	8.53
Mississippi Portal	5.35	10.28	4.91	14.86	28.54	12.87

*Practice 329b, "Mulch Till" in the NRCS Field Office Technical Guide.

Source: ERS analysis of EQIP database (NRCS).

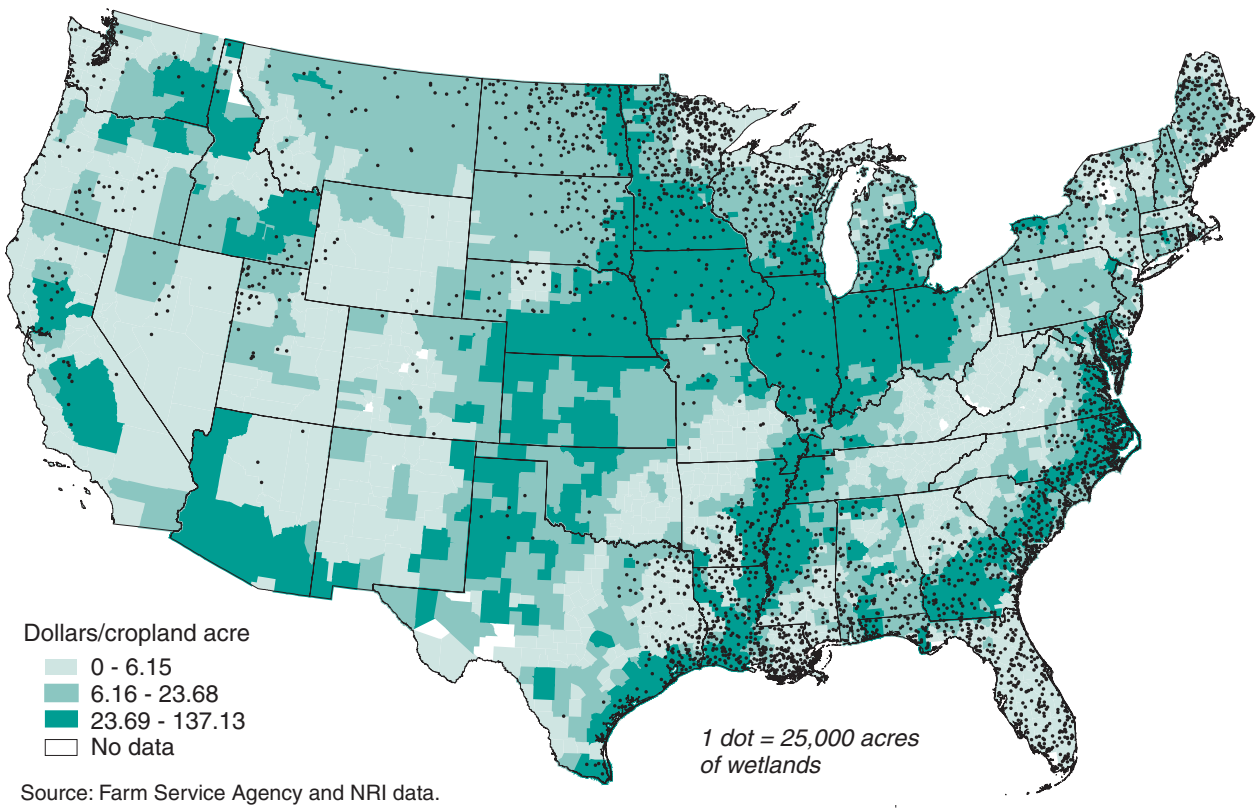
resulting in the loss of $12.3 million in Federal farm program benefits (Claassen et al., 2000). In recent decades, wetland conversion for agricultural production has decreased steadily, a trend older than Swampbuster (1985) or the Tax Reform Act of 1986. Conversion of wetland for crop production averaged 593,000 acres per year in 1954-74 (Frayer et al., 1983), dropping to 235,000 acres for 1974-84 (Dahl and Johnson, 1991), 31,000 acres per year between 1982 and 1992, and 26,000 acres per year between 1992 and 1997 (USDA-NRCS, 2002a).

Evidence on the role of policy change in reducing wetland conversion for agriculture is mixed (see Heimlich et al.,1998, for a full survey). Swampbuster penalties will constrain wetland conversion only when: (1) wetlands are located on farms that participate in Federal programs subject to Swampbuster; (2) those wetlands could be profitably converted to crop production in the absence of Swampbuster; and (3) other policies (e.g., Section 404 of the Clean Water Act) are not applicable or not effective in deterring wetland conversion.

First, Swampbuster will constrain wetland conversion only if wetlands are located on farms that receive government payments. The spatial distribution of government payments and wetland acreage subject to Swampbuster, shown in figure 11, suggests that many wetlands are located in areas that receive only modest payments per cropland acre. Many of these wetlands, however, are located in remote areas and are unlikely to be converted to cropland because they cannot be easily incorporated into an existing farm-

Figure 11

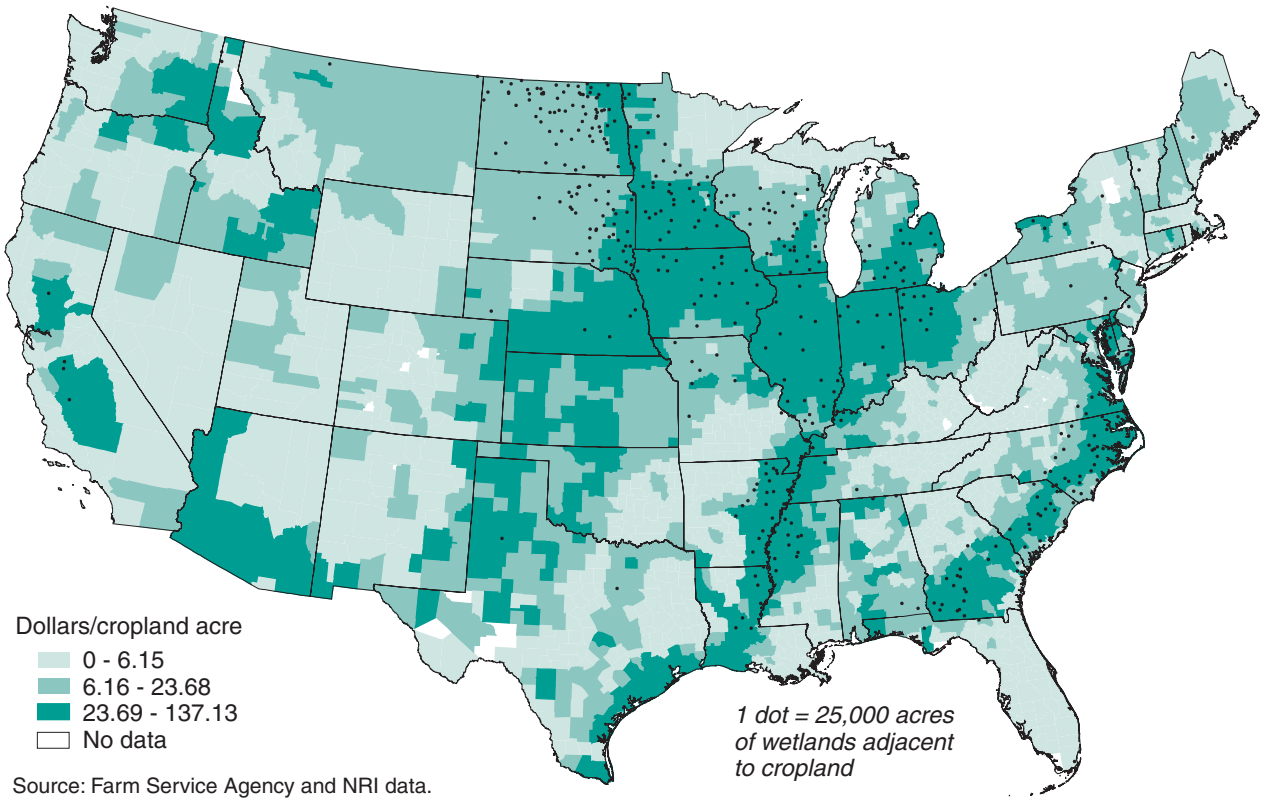
Distribution of commodity program payments and wetlands, 1998



Source: Farm Service Agency and NRI data.

Figure 12

Distribution of commodity program payments and wetlands adjacent to existing cropland, 1998



Source: Farm Service Agency and NRI data.

ing operation. We estimate that only 12.9 million wetland acres are directly adjacent to existing cropland[11] (fig. 12). As might be expected, these wetlands are much more likely to be located in areas that receive larger government payments, increasing the likelihood that these wetlands are, in fact, located on or near farms that receive government payments.

Of course, the fact that wetlands are adjacent to cropland does not imply that they can be *profitably* converted to crop production. Some researchers have questioned whether wetland conversion for crop production is profitable even without Swampbuster (Tolman, 1997; Kramer and Shabman, 1993). Profitability depends on a variety of factors, including crop prices and production costs, soil productivity, and the feasibility and cost of land clearing and drainage. Roughly half of all wetlands in the conterminous United States in 1780 have already been drained (Dahl, 1990), and remaining wetlands may be more difficult or expensive to convert or may be less productive once converted.

Using more detailed data on the potential productivity of wetland soils, other research suggests that there are wetlands that could be profitably converted to crops in the absence of policy constraints. Assuming that only those wetlands that are adjacent to cropland are vulnerable to conversion, Claassen et al. (2000) estimate that between 1.5 and 3.3 million acres of wetlands have sufficiently high productivity to be converted to crop production, depending on producer price expectations. Also, profitability of crop

[11]We used the *habitat composition* variables in the NRI data to determine whether a wetland point is near cropland. We considered NRI points classified as wetland to be "adjacent" to cropland if some cropland occurred along any one of four 500 foot-long transects that extend NW, NE, SE, and SW from the NRI point, as indicated by the *habitat composition* variables.

production on the converted land is not the only consideration in the decision to drain wetland. Wetlands are sometimes drained to increase the efficiency of field operations on existing cropland by eliminating wetland areas that producers must farm around. Roughly 5 million acres of wetland are dry enough in some years for crop production. Although producers may continue to farm these wetlands in their current condition without violating Swampbuster, these wetlands may be particularly vulnerable to additional drainage that would improve production and make field operation more efficient.

Even if wetland conversion potential is, in fact, quite modest, these conversions could significantly undercut wetland restoration efforts. By the end of fiscal year 2002, about 1.275 million acres had been restored through the Wetlands Reserve Program (USDA-NRCS, 2002b). Another 1.6 million wetland acres have been restored through the Conservation Reserve Program (USDA-FSA, 2003). Thus, the total USDA wetland restoration effort since 1990 is less than 3 million acres.

Finally, other laws and regulations that can stop or discourage wetland drainage include Section 404 of the Clean Water Act (CWA) and numerous State and local laws. However, these laws and regulations do not completely protect all wetlands. Section 404 is limited in geographic scope following a recent Supreme Court decision that excludes many isolated wetlands from CWA regulation. In *Solid Waste Agency of Northern Cook County (SWANCC) v. United States Army Corps of Engineers (USACE)*, the Court ruled that USACE could no longer claim jurisdiction over isolated, non-navigable, intrastate ponds on grounds that they are used by economically important species of birds migrating across State lines (National Wetlands Newsletter, 2001). Known as the migratory bird rule, this rationale has often been used to assert CWA jurisdiction over isolated wetlands. The exact extent of wetlands thus excluded from CWA regulation is yet to be determined and will probably be decided by the courts. A patchwork of State and local regulations continues, but provides little or no wetland protection in many States (Kusler, 2001). State wetland regulations exist in the Northeast, States surrounding the Great Lakes, Atlantic Coast States in the South, and along the West Coast (Petrie et al., 2001). Many heavily agricultural Midwestern and Plains States have little, if any, State wetland regulation. In these areas, Swampbuster is the only remaining policy disincentive to draining isolated wetlands.