

Environmental Effects of Policy-Induced Land-Use Changes

Major agricultural programs that are likely to affect land use include price and income support (commodity) programs, subsidized crop insurance, and land retirement programs (e.g., the Conservation Reserve Program). The environmental impacts will depend on the location and physical characteristics of the lands affected by each policy. Lands enrolling in CRP tend to be less productive and to have different physical characteristics, locations, and environmental implications than other lands at the extensive margin of cultivated crop production. The CRP is an example of a policy that expressly offers incentives to take particular types of land out of agricultural production. The next step in our analysis is to identify the particular lands at the extensive margin potentially brought **into** production as an unintended consequence of Federal farm policies.

While other Federal policies and farm programs could have larger effects on cropland area, we focus on federally subsidized crop insurance for two reasons. First, this is a large program, and there has been great concern expressed over the environmental characteristics of lands brought into production due to such risk-reducing farm programs. In a 1999 letter to Congress, 27 conservation and taxpayer groups argued that crop insurance subsidies would encourage farmers to cultivate crops in flood- and drought-prone areas and thus promote the conversion of environmentally sensitive forest and pasturelands to crop production (Environmental Defense, 1999). The contention is that crop insurance tends to encourage the cultivation of lands that provide low or highly variable crop returns, and that these are the precise areas where the environment is particularly sensitive to crop cultivation. For example, in the context of a different Federal policy, Stavins and Jaffe (1990) found that Federal flood control projects had the unintended consequence of promoting cropland expansion onto forested wetlands, which are valuable ecosystems for fish and wildlife and important for water quality.

Second, determining how government policies affect land-use change requires distinguishing the effect of the policy from other factors like changes in commodity prices. CRP, as a land retirement program, directly involves land-use conversion (we considered CRP as a distinct land use and directly examined the characteristics of CRP lands earlier).¹ Participation in crop insurance and other Federal farm programs does not directly require a change in land use. Farmers buying crop insurance for a parcel of land might well cultivate crops there even without the insurance program. About 182 million acres were insured in 1997, or 56 percent of total cultivated cropland in the 48 contiguous States (Glauber and Collins, 2002).

While crop insurance participation does not require land-use conversion, additional analysis might identify unintended land-use impacts from the

¹With some caveats, examination of the land-use effects of CRP can be largely restricted to those particular lands participating in the program. One caveat is the possibility of “slippage,” the extent to which cropland retirement under the program might be offset by consequent reallocations of other lands outside the program to cultivated cropland uses (Wu, 2000; Roberts and Bucholtz, 2005). This might be expected if land retirement is significant enough to alter commodity prices. Another caveat is that CRP lands that would have left crop production even without the program do not represent cropland retirements directly attributable to CRP. Lubowski et al., (2003) estimate such lands at 8 percent of 1997 CRP acres.

Federal crop insurance program. The large increase in crop insurance subsidies after the 1994 Crop Insurance Reform Act can be used as a natural experiment to observe how land-use conversions change in response to crop insurance subsidies. We identify the impact of this policy change by comparing land-use changes before and after the 1994 Act in response to different increases in the expected return to crop insurance. This approach allows us to isolate the impact of the policy change because the sharp reductions in farmers' insurance costs due to the 1994 Act are likely to be unrelated to other unobserved factors affecting land use locally.

Analytical Model: The Effect of Crop Insurance Subsidies on Land-Use Change

Are the benefits of subsidized crop insurance large enough to affect land-use decisions? Crop insurance can benefit producers by reducing risk or increasing returns. If insurance rates are actuarially fair, expected payouts equal the premiums paid by the beneficiaries. Crop insurance would reduce the variability of returns without changing the average return to crop production. In years without losses, insurance costs would lower returns slightly. In years with indemnified losses, returns would be higher than without insurance due to the insurance payouts. For risk-averse producers, insurance would increase benefits from crop production and could encourage more cultivation.

Because of information constraints, heterogeneous risks, and other factors, some producers may be charged premiums that are below actuarially fair rates, while others are charged rates above actuarial fairness (Serra et al., 2003; Just et al. 1999; Coble et al., 1996; Vandever and Loehman, 1994; Goodwin, 1993). Just et al., (1999) suggest that risk reduction is a minor motive for most crop insurance participants and that most participating producers enjoy an increase in average returns over time because subsidies reduce crop insurance premium rates below actuarially fair levels.

By reducing the risk and/or increasing the expected return from crop production, subsidized crop insurance may increase the amount of land in cultivated crops. Almost all studies on crop insurance subsidies have noted the potential for environmental damage due to expanded crop production, particularly if economically marginal land is also more environmentally sensitive. A growing body of literature has focused on the land-use effect of crop insurance (Goodwin et al., 2004; Deal, 2004; Goodwin and Smith, 2003; Keeton et al., 1999; Wu, 1999; Young et al., 2001; Griffin, 1996), as well as agricultural disaster payments (Gardner and Kramer, 1986). This research has chiefly relied on aggregate (county-level) data and has not identified the environmental characteristics of lands affected by the crop insurance policies. Previous studies, including one of the few farm-level analyses (Wu, 1999), focus on subsets of crops and relatively small geographic regions, limiting an assessment of the overall impacts of subsidized crop insurance. Most analyses, moreover, do not examine changes in cropland over time, making it difficult to distinguish the effect of policies from other factors that could drive land-use decisions in different locations. Finally, some studies use simulation models that hinge on assumptions about farmers' responses to changes in risk (e.g., Young et al., 2001).

Since the early 1990s, significant increases in premium subsidies have probably expanded the group of producers with positive expected (average) returns to crop insurance. Our estimates of the impacts of crop insurance subsidies use data on observed changes in land use on individual land parcels before and after 1994. In that year, the Crop Insurance Act increased premium subsidies for all crop insurance products while adding catastrophic coverage and revenue insurance options. Further premium subsidy increases were enacted in 1999-2000. Depending on the level of coverage purchased, subsidies can be as high as 67 percent of producers' insurance costs, up from a maximum of 30 percent prior to 1994, while catastrophic (CAT) coverage is offered for a nominal cost. Crop insurance participation rates rose with the growth in subsidies (Dismukes and Vandever, 2001). Insured acreage more than doubled from about 90 million to 197 million acres between 1990-94 and 1995-99, and then rose to 212 million over 2000-03. Program costs roughly doubled to \$1.5 billion a year between 1990-94 and 1995-99, and then doubled again (to \$3.1 billion) after the Agricultural Risk Protection Act of 2000 (Glauber and Collins, 2002).

Most of the research on crop insurance and land in crop production uses data that pre-date even the 1994 crop insurance subsidy increases.² Yet these subsidy increases are a natural experiment from which to measure land-use decisions against an exogenous change in premium rates. Our econometric model of land-use change is based on the parcel-specific data on land use and land characteristics from the 1992 and 1997 National Resources Inventory (NRI). This period spans the change in expected benefits from crop insurance resulting from the 1994 Act and allows us to relate changes in land use to changes in the expected benefits from crop insurance. Because NRI collects data on the same points of land over time, it is possible to define gross land-use changes—rather than just net movements—and to identify the type or quality of land that is actually changing use. Therefore, it is possible to estimate the characteristics, location, and quantity of land brought into and retained in crop production because of the insurance premium subsidy increases.

By estimating responses to changes in insurance benefits, we control for many unobserved factors that might also affect the amount of land in crop production. The underlying assumption is that regional variation in subsidy-induced changes in insurance benefits is unrelated to other, unobserved factors driving land use during 1992-97.³

Factors that influence land-use choices include the profitability of alternative land uses, which vary over time and among regions. While we lack information on the profitability of different land uses for each parcel of land in the NRI, we do have information on several physical features of each parcel, including land quality, erodibility, slope, proneness to flooding, and location. These data can be used as proxies for the profitability of alternative land uses, as well as for the costs of converting from one land use to another. The 1996 Federal Agriculture Improvement and Reform (FAIR) Act also introduced changes to farm programs, which likely affected cropland use during our period of analysis. We combine NRI's parcel-specific data with county-level data on insurance returns, government payments, and the profitability of alternative land uses to develop an econometric model of

²An exception is the recent study by Goodwin et al. (2004), which includes an analysis of wheat and barley production in the Northern Great Plains over 1997-98.

³By studying changes in land use over time, our analysis controls for unobserved factors determining the initial disposition of land use across the country in 1992. Nevertheless, if there were different trends in land-use change in different locations and unobserved factors driving these trends were related to changes in the expected benefits from crop insurance, this could introduce bias into our estimates.

land-use change that covers the contiguous 48 States (appendix D). This model estimates the probability that an NRI parcel used for either cultivated crops or uncultivated crops and pasture moves from its current use to any of six major land-use alternatives (cultivated crops, uncultivated crops and pasture, CRP; range, forest, and urban) between 1992 and 1997. This model should capture the majority of the changes in cultivated cropland, as transitions from uncultivated crops/pasture accounted for 77 percent of the acreage moving to cultivated cropland over 1992-97. (We also estimated models for land used for forests, range, and CRP in 1992, but there were too few observations to achieve convergence during the bootstrapping runs used to calculate confidence intervals for the estimates).

Changes in returns to crop insurance are our key explanatory variable and are measured as the change in crop revenue due to insurance program participation. This is computed as a weighted average across eight major crops (corn, wheat, soybeans, cotton, sorghum, barley, oats, and rice) of the (expected) crop insurance indemnity minus the insurance price faced by the farmer. This price equals the full crop insurance premium minus the premium subsidy, which is paid by the government. The expected indemnity is based on an average of indemnity payments over the previous 10 years, by county (see appendix D for more detail).⁴ Crop insurance program data are available from USDA's Risk Management Agency (RMA). Data include total indemnities, total premiums, and the subsidy by crop, insurance product, and county.

The change in crop insurance returns is positively related to the likelihood that land transitioned to cultivated cropland from another use, and to the likelihood that land cultivated in 1992 remained cultivated in 1997. To identify the magnitude of these effects, we use the estimates from our econometric model to conduct a counterfactual simulation of 1992-97 changes in land use and the resulting 1997 land in each use at every NRI point, under the assumption that the change in expected crop insurance returns was zero. The difference between land use under this scenario and land use in reality—which reflects the effects of the actual 1992-97 change in insurance returns—provides an estimate of the land-use effects of the 1994 change in crop insurance premium subsidies.⁵

Higher Insurance Subsidies Increased 1997 Cropland Acreage by Up to 1 Percent

Most researchers who have studied the impact of crop insurance on land use have found that land-use effects are small, on the order of 1-2 million acres (Goodwin et al., 2004; Young et al., 2001). One study—an unpublished manuscript by Keeton et al. (1999)—argues that expansion of crop insurance policies during the mid-1990s led to the introduction of 15 million new cropland acres (50 million if land in CRP is included) or about 5 percent of cultivated cropland.

Our results indicate that the increase in crop insurance subsidies changed land use measurably, but modestly (table 5.1). The change in premium subsidies in the mid-1990s increased cultivated cropland area (1997) by an estimated 2.5 million acres, or 0.82 percent, with the bulk of this land (1.8

⁴We focus on buy-up insurance, but also examined specifications adjusting for changes in catastrophic insurance coverage (see appendix D).

⁵In our analysis, we do not compare land use under the counterfactual scenario of no crop insurance subsidy increase to the observed patterns of land use reported in the 1997 NRI. Rather, we compare the counterfactual scenario to land use under a simulated “factual” baseline predicted from our estimated parameters fitted with the actually observed values for the change in insurance returns and all other variables (see appendix D). In this way, we produce estimates of the land-use impacts of the change in crop insurance returns that are internally consistent within the framework of the econometric model.

Table 5.1

**Estimated effect of crop insurance subsidy change (1994)
on 1997 land use**

Land use	Actual policy 1992-97 (Subsidy Increase)	Counterfactual (No Subsidy Increase)	Estimated impact of policy	Estimated impact of policy
	A	B	A-B	100*(A-B)/A
	1,000 acres	—1,000 acres ¹ —		Percent ¹
Cultivated crops	300,639	298,161 (297,295-299,034)	2,475 (1,605 to 3,344)	0.82 (0.53-1.11)
Uncultivated crops and pasture	181,257	183,053 (178,819-180,103)	-1,796 (1,154-2,438)	-0.99 (0.64-1.35)
Forest	391,534	391,668 (391,351-391,449)	-134 (85-183)	-03 (02-05)
Urban	69,672	70,092 (69,100-69,405)	-420 (267-572)	-0.60 (0.38-0.82)
CRP	35,721	35,762 (35,660-35,669)	-41 (22-61)	-0.11 (06-0.17)
Range	400,294	400,379 (400,173-400,245)	-85 (49-121)	-02 (01-03)

¹ 95-percent confidence interval for the estimates in parentheses.

Source: 1997 National Resources Inventory and ERS estimates from this study.

million acres) coming from uncultivated crops and pasture. This estimated impact on cultivated cropland area is statistically different from zero, ranging from 1.6 to 3.3 million acres (0.5-1.1 percent), with 95-percent confidence. This estimate rises by about 12 percent (380,000 acres) if shifts from forests, range, and CRP land are also considered, but confidence intervals could not be computed for this additional estimated impact due to insufficient observations (appendix D).

These estimates are not directly comparable with previous studies, as we use more recent data and focus only on the 1992-97 changes in crop insurance subsidies rather than the overall impacts of the crop insurance program. Our estimates likely capture much of the program's overall impact, given that crop insurance participation and total premiums more than doubled over 1992-97.⁶ Our estimated effect is in the range of the most recent empirical estimate that a 30-percent increase in premium subsidies (more than twice the 1992-97 change) would increase acreage of major crops from 0.2 to 1.1 percent (Goodwin et al., 2004).⁷

Crop Insurance Has a Disproportionate Impact on Low-Productivity and Certain Environmentally Sensitive Land

While the insurance policy change is estimated to affect just about 1 percent of total cultivated cropland, the increase in insurance subsidies appears to have had the largest effect for low-productivity and certain environmentally sensitive land. Our estimate of land retained in cultivation due to subsidy increases includes land that is lower quality than the national average for cultivated cropland (table 5.2).⁸ On the estimated

⁶During these years, insured acreage increased from 83 million to 182 million acres, while total premiums increased from \$0.7 billion to \$1.8 billion (Glauber and Collins, 2002).

⁷Premium subsidies for the 65-percent coverage level were increased from 30 percent to 42 percent under the crop insurance acts of 1994 (Goodwin et al., 2004).

⁸Given the relatively small numbers of land parcels affected by the change in crop insurance subsidies, local comparisons are not statistically significant and are not reported.

Table 5.2

Characteristics of additional cropland cultivated due to crop insurance subsidy increases, relative to CRP and other cropland

Land characteristic	Predicted land in cultivation in 1997 due to crop insurance subsidy change ¹	All cultivated cropland in 1997 ¹	CRP land in 1997 ¹
Soil rating for plant growth (SRPG)	56.0 (55.9-56.1)	60.2 51.3 (60.1-60.3)	(51.1-51.5)
% highly erodible land (HEL)	32.3 (32.2-32.3)	24.8 (24.5-25.1)	56.4 (55.9-56.7)
Rainfall erodibility index (EI)	4.89 (4.82-4.95)	4.34 (4.29-4.38)	7.41 (7.30-7.53)
Wind erodibility index (EI)	4.08 (4.05-4.11)	3.54 (3.50-3.59)	7.24 (7.19-7.28)
% Wetland ²	2.94 (2.89-3.0)	2.44 (2.36-2.52)	1.78 (1.69-1.88)
% Frequently flooded	1.97 (1.96-1.99)	1.81 (1.73-1.88)	0.99 (0.91-1.17)
Imperiled animal species (counts/watershed)	3.11 (3.09-3.12)	2.61 2.01 (2.57-2.65)	(1.99-2.03)
Imperiled plant species (counts/watershed)	3.02 (3.01-3.03)	2.14 1.46 (2.07-2.21)	(1.45-1.47)
Imperiled bird species (counts/watershed)	0.32 (0.32-0.32)	0.31 0.39 (0.31-0.32)	(0.39-0.39)
Imperiled fish and mollusk species (counts/watershed)	1.29 (1.28-1.29)	1.06 0.81 (1.05-1.07)	(0.79-0.81)
Nitrogen to surface water (1,000 lbs/acre/year)	11.37 (11.29-11.46)	10.57 9.19 (10.51-10.61)	(9.13-9.26)
Nitrogen to estuary (1,000 lbs/acre/year)	0.51 (0.51-0.52)	0.43 0.32 (0.43-0.44)	(0.32-0.32)
Nitrogen leaching (1,000 lbs/acre/year)	8.90 (8.89-8.91)	5.82 4.49 (5.78-5.88)	(4.46-4.52)
Phosphorus to surface water (1,000 lbs/acre/year)	0.71 (0.71-0.71)	0.65 0.61 (0.65-0.65)	(0.61-0.62)

¹ 95-percent confidence interval for the estimates is in parentheses. Confidence intervals for the predictions (first column) were estimated by bootstrap (see appendix D). Confidence intervals for second and third columns based on NRI's stratified survey design.

² Wetlands are defined according to the Cowardin classification system (Cowardin et al., 1979).³

Source: 1997 National Resources Inventory (NRI), NatureServe, EPIC-based nutrient indicators, Soil Survey Geographic (SSURGO) data set, and ERS estimates from this study.

acres in cultivation due to the increases in insurance subsidies, average soil productivity in terms of SRPG was 56, compared with 60 for all cultivated cropland. While 25 percent of all cultivated cropland was classed as highly erodible in 1997, an estimated 32 percent of cultivated acreage due to the increased subsidies was highly erodible land. These differences are statistically significant (at the 95-percent confidence level) and consistent with our earlier finding that extensive margin lands are less productive and more erodible than overall cropland.

Our findings are also consistent with concerns that lands affected by crop insurance are likely to lie in floodplains and, in the case of wetlands, on environmentally sensitive ecosystems. Lands affected by changes in insurance subsidies were slightly more prone to frequent flooding and were more likely to include wetlands than average cultivated cropland (table 5.2). These differences, too, are statistically significant. Total wetlands affected by the 1992-97 subsidy increase are estimated at 37,000 acres, roughly 0.7 percent of the 5.4 million acres of wetlands under crop cultivation. But the affected wetlands represent about a fifth of the net loss (163,000 acres) in non-Federal wetland area between 1992 and 1997 (USDA/NRCS, 2000). Ending crop production and restoring these wetland acres could make a difference in the overall loss of wetland function. Of course, realizing these gains may require more than just discontinuing crop production.

With the 1985 Farm Act, the Government made implementing soil conservation measures on highly erodible land (HEL) and avoiding drainage of wetlands requirements for receiving certain farm program benefits, including subsidized crop insurance (Claassen et al., 2004). Our estimated increase in cultivated wetlands due to the insurance subsidy change could be due to retention of previously cultivated wetland acres, which were grandfathered into the law, rather than to bringing new land into cultivation. The 1996 Farm Act also removed crop insurance from the list of programs subject to conservation compliance. This change potentially encouraged some crop cultivation on wetlands and HEL by reducing the incentives of insured farmers not to cultivate these land types. Because the compliance provisions did not change until April 1996, however, it is not clear how large an effect this could have had on the land-use change over 1992-97. Most insured crop producers also receive commodity payments, which would still have triggered a compliance requirement. As a result, the change in the compliance status of crop insurance may have had little impact on cultivated acreage of HEL and wetlands.

Crop insurance subsidies are also estimated to increase cultivation in areas subject to greater potential nutrient losses to water. While our nutrient loss estimates take into account land erodibility, they may not accurately reflect differences in fertilizer applications on extensive margin lands. All four nutrient loss indicators are higher, on average, for those croplands estimated to be in cultivation due to the increase in crop insurance subsidies than for cultivated croplands overall. In contrast, CRP lands have below-average levels of potential nitrogen and phosphorus losses.

Given the evidence that crop insurance affects land use on land that is both economically and environmentally marginal, larger insurance premium subsidies may be offsetting benefits from agri-environmental programs such as the CRP, as other researchers have suggested (e.g., Goodwin and Smith,

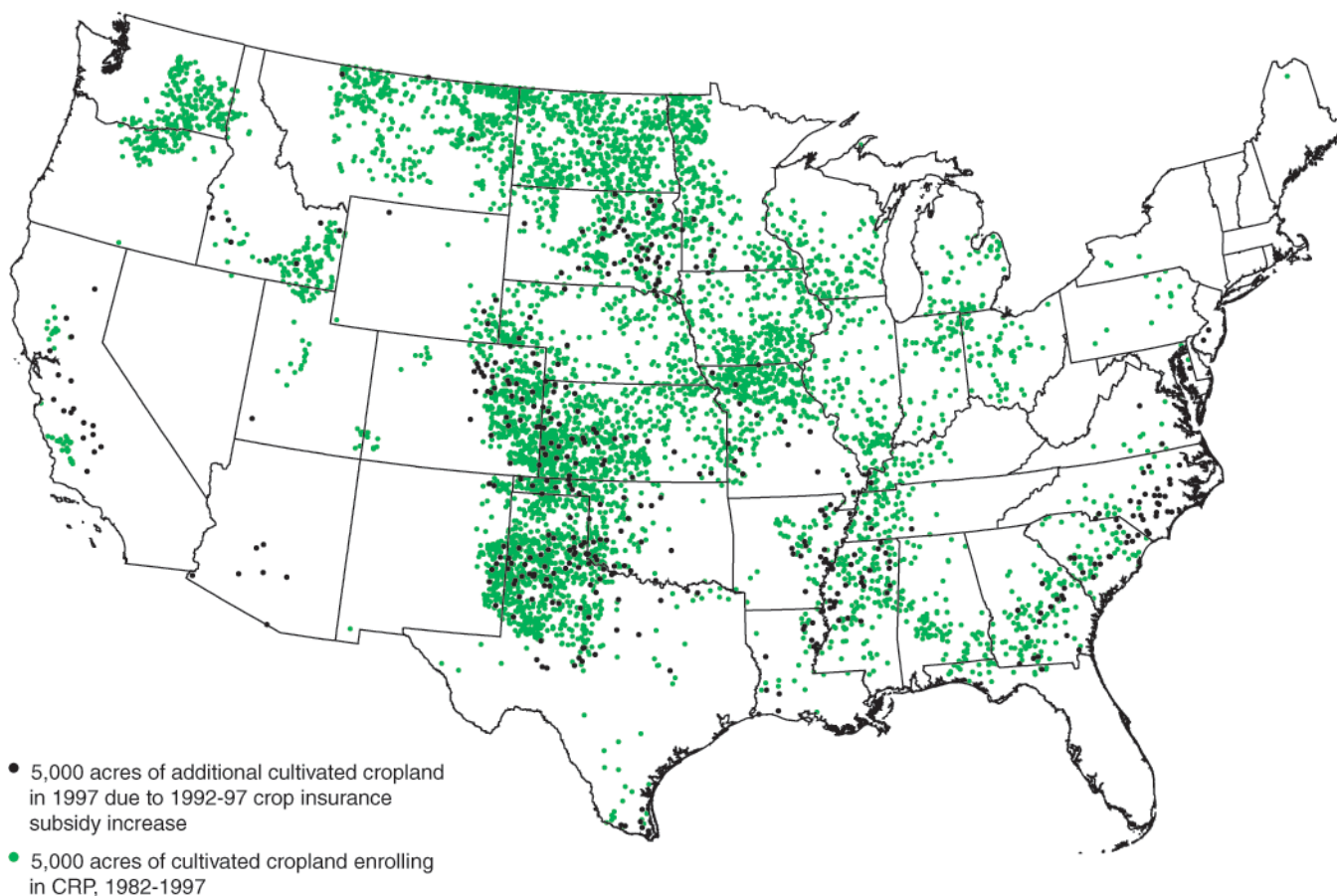
2003). That is true to the extent that the land in cultivated crops due to the crop insurance subsidy increase is also targeted for CRP enrollment. Acres estimated to be in crop cultivation due to crop insurance subsidies and acres enrolled in CRP are both, on average, more erodible and less productive than overall cropland (table 5.2). A different pattern is evident in the case of wetlands and land subject to frequent flooding. While the land cultivated due the increased subsidies is more likely than overall cropland to contain these land types, CRP is less likely to enroll these lands (table 5.2).

Moreover, the location of CRP enrollments differs from that of cultivated croplands added from the 1992-97 increase in crop insurance subsidies (fig. 5.1). Acres estimated to be in crop cultivation due to crop insurance subsidies (the black dots) are clustered in certain regions (Prairie Gateway, Mississippi Portal, and Eastern Seaboard) and not uniformly spread through CRP areas (the green dots).

The Heartland (Missouri, Iowa, Illinois, Indiana, Ohio) has extensive cropland and a fair amount of land shifting in and out of cultivated crops. This region,

Figure 5.1

Location of CRP enrollments and of additional cropland estimated due to crop insurance subsidy increases, 1997



Note: Size of dots is not proportional to actual land area.

Source: ERS estimates and 1997 National Resources Inventory (NRI).

however, has relatively few CRP lands (except for a cluster in Iowa and Northern Missouri) and virtually no estimated lands in production due to the change in crop insurance subsidies. This pattern may be explained by variation in the actuarial performance of the crop insurance program.⁹ Lands are estimated to have shifted into cultivation as a result of crop insurance in areas where crop insurance was a better deal for farmers (e.g., the actuarial performance was worse). The Federal crop insurance program has historically performed better for corn and soybeans in the Midwest, and more poorly for cotton in the Southern Plains (Young et al., 2001).

Lands Affected by Crop Insurance Subsidies and Imperiled Species Habitat

Estimated lands in cultivation due to the increase in crop insurance subsidies include some areas with high populations of imperiled wildlife species. In particular, the cluster of added lands in the Plains States coincides with an area of high CRP enrollment and high counts of imperiled birds. Added lands along the Mississippi River and Eastern Seaboard are in watersheds that overlap with habitats of imperiled fish and mollusks. The lands predicted to be in cultivation due to the increase in crop insurance subsidies are disproportionately located in watersheds with higher counts of imperiled vertebrates, plants, and fish/mollusks (relative to the average for cultivated cropland) (table 5.2). In contrast, CRP lands lie in areas with greater counts of imperiled birds (but not of other imperiled species) (table 5.2).

This is consistent with the fact that protecting habitat, particularly for birds, is an express CRP objective. Other areas with relatively high levels of imperiled species, such as Appalachia, have little or no extensive margin changes in cultivated cropland (see chapter 4). Available data are not sufficient to determine whether observed or predicted land-use changes have an impact (positive or negative) on imperiled wildlife populations.

Crop Insurance Effects on Wind and Water Erosion

Changes in cultivated crop acreage prompted by the increase in crop insurance subsidies translate into small aggregate changes in soil erosion, despite higher levels of erosion per acre than other cropland. While the NRI reports erosion levels given 1997 land use, we estimate erosion under the hypothetical scenarios of no insurance subsidy change and no CRP using our economic estimates and erosion data for lands with similar physical characteristics (see appendix E). While land in cultivated crops is estimated to increase 0.8 percent, wind and water erosion in 1997 are estimated to increase by 1.4 and 0.9 percent as a result of the increase in insurance premium subsidies (table 5.3).

This environmental impact is much smaller than that of the 32.7 million CRP acres enrolled in 1997.¹⁰ CRP is estimated to reduce wind erosion 16 percent and water erosion 7 percent below the 1997 baseline.¹¹ Since cultivated cropland enrolled in CRP accounted for about 8 percent of total culti-

⁹These estimates account for the fact that the level of participation in the crop insurance program was already high in the Heartland, with less potential for an increase than in regions with historically low participation levels (appendix D).

¹⁰For the CRP analysis, we assume that land area affected by CRP is limited to the enrolled acres (see Appendix D). Thus, lands not enrolled in CRP in 1997 remain in their observed 1997 use in our simulation of the environmental impacts in our baseline without the program. This assumes no shifts of non-crop lands into crop production in response to CRP. If such “slippage” is significant, the amount of land enrolled in CRP overestimates the actual cropland reduced by the program and our estimated environmental benefits from CRP would thus be overstated. Wu (2000) estimated that about 21 acres have been brought into crop production for every 100 retired through CRP. More recent studies using the same data have found no evidence of slippage, suggesting that the magnitude of slippage remains an open question (Roberts and Bucholtz, 2005).

¹¹Our estimates indicate that annual wind and water erosion in the contiguous 48 States in 1997 declined by 135.5 and 86.1 million tons, respectively, as a result of CRP (table 5.3). These aggregate figures are almost identical to estimated 1997 reductions of 134.6 and 89 million tons from Sullivan et al., (2004). The Farm Service Agency (FSA) reports annual wind and water reductions from CRP of 241 and 166 million tons for 2000, when overall CRP enrollment was 31.4 million acres (USDA/FSA 2004a). These reductions are substantially larger on a per acre basis than our estimates. The differences can be accounted for principally by FSA’s assumption that CRP land would be cropped under pre-CRP management conditions in the absence of the program. In contrast, our estimates and Sullivan et al. (2004) reflect some CRP lands exiting cultivation without the program as well as 1997 baseline erosion rates, which were significantly lower than 1982 rates for cultivated cropland (see figs. 3.2 and 3.3).

Table 5.3

Estimated erosion impacts of policy-driven land-use changes

Environmental indicator	Crop insurance subsidy increase			Conservation Reserve Program		
	Impact on 1997 baseline levels ¹	Impact as % of 1997 baseline ²	Impact per acre	Impact on 1997 baseline levels ¹	Impact as % of 1997 baseline ²	Impact per acre
Wind erosion	9,311	1.4	3.8	-135,497	-15.8	-4.1
Water erosion	10,931	0.9	4.5	-86,074	-7.2	-2.6

¹ Erosion values are in 1,000 tons/acre/year.

² Different 1997 baselines are used for the crop insurance and CRP analyses to generate internally consistent estimates for each policy as described in appendix D.

Source: ERS estimates and data from the 1997 National Resources Inventory (NRI).

vated cropland in 1997, the estimated 16-percent reduction in wind erosion is even more notable.¹²

Lands affected by the change in crop insurance subsidies and by CRP are more susceptible to wind erosion damage than average cultivated cropland, but vulnerability to rainfall erosion appears about average. This is in contrast to other extensive margin lands, which are more susceptible to rainfall and often wind erosion damage than cultivated cropland overall (see chapter 4). Differences in water erosion are driven largely by slope. Wind erosion depends on site-specific conditions as well as climatic factors, which vary regionally. Thus, policy changes, which might target lands in particular geographical areas, could affect lands that are more vulnerable to wind rather than rainfall erosion.

The environmental impacts of the lands affected by the different policies also differ. Lands estimated to be brought into or retained in production due to increased crop insurance subsidies had, on average, higher rates of water erosion but lower rates of wind erosion than lands enrolled in the CRP (table 5.3). This could be due to the greater proportion of acres cultivated due to the crop insurance subsidy change outside of the Plains, a region with above-average wind erosion. This acreage was less vulnerable than CRP lands in terms of potential nitrogen runoff to surface water, but more vulnerable in terms of potential nitrogen leaching as well as runoff reaching estuaries. This is perhaps due to the greater concentration of lands in cultivation due to the increase in crop insurance subsidies along the Mississippi Portal. Different agricultural and conservation policies thus affect different subsets of lands along the extensive margin with different intended—and unintended—environmental implications.

¹²For our erosion calculations, net reductions in cropland for CRP are actually somewhat less than 8 percent as we allow CRP lands to leave crop production in the absence of the program. Thus, the CRP's per acre reductions in wind and water erosion are even larger than the reported numbers.