6.1. Conservation and Environmental Programs Overview

USDA conducts a broad range of conservation programs intended to protect natural resources and the environment from the adverse consequences of agricultural production. Recently, the Federal Agriculture Improvement and Reform Act of 1996 modified and extended a number of these programs, and consolidated four cost-sharing programs into a new Environmental Quality Incentives Program (EQIP). The 1996 Act also created several new conservation programs intended to protect wildlife and grazing lands, and to reduce economic losses in floodplains. In 1996, USDA's conservation program expenditures represented half of total Federal conservation and environmental spending affecting agricultural lands, and over half of USDA's conservation expenditures were for rental or easements payments on lands in conserving uses.

Contents

Since the 1930's, USDA has administered a broad range of conservation and environmental programs to assist farmers, ranchers, and landowners in conserving and improving soil, water, and other natural resources associated with agricultural land. Current USDA conservation programs follow one or more of the following basic policy approaches:

- Technical assistance and extension education,
- Cost-sharing assistance for practice installation,
- Public works project activities,
- Rental and easement payments to place land into conservation uses,
- Compliance provisions, which require the implementation of approved conservation plans or the avoidance of certain land use changes if the operator wishes to remain eligible for USDA program benefits, and
- Conservation data and research aimed at developing an information base and improving conservation practices and program delivery.

The first two approaches are used to some degree in most USDA conservation programs, but are most prevalent in the new Environmental Quality Incentives Program (EQIP) and the programs it replaced. The third approach—public works project activities—is used for watershed protection and flood prevention

activities. The fourth approach—payments for placing lands in conserving uses—has been used at various times in the past, such as the "Soil Bank" program of the late 1950's, and currently characterizes the Conservation Reserve (CRP) and Wetlands Reserve (WRP) Programs. The compliance approach to conservation originated in the 1985 Food Security Act with the conservation compliance, sodbuster, and swampbuster provisions. This approach essentially adds soil and wetland conservation as additional requirements for receipt of a wide array of farm program payments. The sixth approach—research and data development—is essential to the other five approaches and is undertaken by the Agricultural Research Service (ARS), the Cooperative State Research, Education, and Extension Service (CSREES), the Economic Research Service (ERS), the Forest Service (FS), and the Natural Resources Conservation Service (NRCS).

For the most part, the Federal Government has not employed direct regulation to deal with nonpoint source natural resource and environmental problems associated with agricultural lands. (The conservation compliance, sodbuster, and swampbuster provisions are not regulatory since they apply only to those who participate in farm programs, and farm program participation is voluntary.) However, the Environmental Protection Agency (EPA) does regulate the production and use of pesticides under FIFRA, as amended by the Food Quality Protection Act, and animal waste discharges from large confined livestock operations under the Clean Water Act. An increasing number of States also regulate pesticide use and land-use practices. Voluntary approaches to agricultural resource problems not only avoid the inherent difficulty in regulating nonpoint sources of pollution, but also educate and fund farmers so that they might willingly make improvements in production practices to achieve conservation and environmental goals. In passing the Federal Agriculture Improvement and Reform Act of 1996 (1996 Farm Act), Congress reaffirmed its preference for dealing with agricultural natural resource problems through voluntary approaches.

New USDA Conservation Programs

Environmental Quality Incentives Program (EQIP). EQIP was established by the 1996 Farm Act as a new program to consolidate and better target the functions of the Agricultural Conservation Program (ACP), the Water Quality Incentives Program (WQIP), the Great Plains Conservation Program (GPCP), and the Colorado River Basin Salinity Program (CRBSP). These four terminated programs are discussed more in the next section. EQIP will be administered by NRCS with the concurrence of the Farm Service Agency (FSA).

The objective of EQIP is to encourage farmers and ranchers to adopt practices that reduce environmental and resource problems. By statute, half of the available funds for EQIP are to be targeted at conservation practices relating to livestock production, and there is general statutory guidance to manage EQIP so as to maximize environmental benefits per dollar expended. During 1996-2002, USDA will provide technical assistance, education, cost-sharing, and incentive payments to producers who enter into 5- to 10-year contracts implementing EQIP conservation plans. The program will be available to farmers and ranchers who own or operate land on which crops or livestock are produced, including cropland, pasture, rangeland, and other lands identified by the Secretary.

Producers who implement land management practices (e.g. nutrient management, tillage management, grazing management) can receive technical assistance, education, and incentive payment amounts to be determined by the Secretary. Producers that implement structural practices (e.g. animal waste management facilities, terraces, filterstrips) can receive technical assistance, education, and cost-sharing of up to 75 percent of the projected cost of the practice(s). However, large confined livestock operations generally will be ineligible for cost sharing to construct animal waste management facilities.

An evaluation and selection process is being used to target EQIP funds. First, NRCS solicits priority area proposals from local work groups through the State Conservationist. These proposals are evaluated at the national level, and based on the proposals and other information on conservation needs, EQIP funds are allocated to the States. Once allocations are made, it is the responsibility of the State Conservationist to see that environmental benefits per dollar are maximized. Nearly 600 project area proposals were submitted to the national level in FY 1997.

Some producers outside priority areas may also receive EQIP assistance, especially for low-cost but environmentally effective practices such as nutrient testing. USDA has proposed that up to 35 percent of EQIP funds be available for identified problems outside priority areas.

Program funding for EQIP will be $200 million annually through 2002 except for fiscal year 1996 when funding was $130 million. Congress authorized this $130 million to be paid out through ACP, WQIP,

GPCP, and CRBSP to fulfill EQIP purposes. In general, cost-share and incentive payments paid to a producer under EQIP may not exceed $10,000 for any fiscal year or $50,000 for a multi-year contract. However, the Secretary has the authority to pay a producer more if it is determined to be essential to the purposes of the program.

Wildlife Habitat Incentives Program (WHIP). WHIP was created by the 1996 Farm Act to provide cost-sharing assistance to landowners for developing habitat for upland wildlife, wetland wildlife, threatened and endangered species, fish, and other types of wildlife. The 1996 Farm Act authorized a total of $50 million from CRP funds to conduct the program for fiscal years 1996-2002. NRCS will administer the program.

With the assistance of NRCS, participating landowners will develop plans that include schedules for installing wildlife habitat development practices and requirements for maintaining the habitat for the life of the agreement. Agreements will last a minimum of 10 years from the date the practices are established. Cost-share payments may be used to establish practices needed to meet the objectives of the program, and replace practices that fail for reasons beyond the landowner's control.

Conservation Farm Option (CFO). The 1996 Farm Act established CFO pilot programs for producers of wheat, feed grains, cotton, and rice. NRCS will administer CFO with the concurrence of FSA. Only owners or operators with contract acreage enrolled in the Agricultural Market Transition Program are eligible for participation. Under the pilot programs, producers can receive one consolidated annual USDA conservation payment in lieu of separate payments from CRP, WRP, and EQIP. The producer must implement a conservation farm plan that addresses soil, water, and related resources, water quality, wetlands, and/or wildlife habitat. Participation is voluntary and based upon a 10-year contract between the Commodity Credit Corporation (CCC) and the producer, with a potential 5-year extension. The 1996 Farm Act authorized funding for fiscal 1997 at $7.5 million, increasing to $62.5 million in 2002. A total of $197.5 million of CCC funds is dedicated to this option for FY 1997-2002. However, Congress subsequently limited the program to $2 million for 1997 in the 1997 Agricultural Appropriations Act. USDA is expected to issue program regulations by late summer, 1997.

Farmland Protection Program (FPP). FPP was established by the 1996 Farm Act to purchase voluntary conservation easements or other interests in lands with prime, unique, or other highly productive soils. NRCS will administer FPP with the concurrence of FSA. To be eligible, land must be subject to a pending offer from a State, tribe, or local government for the purposes of protecting topsoil by limiting nonagricultural uses of the land. The Farm Act authorized up to $35 million of CCC funds to carry out this program.

In 1996, States, Indian tribes, and local governments offered 628 proposed easements covering over 175,000 acres of land in 20 States. The proposals had a total projected easement cost of $330 million. Of this amount USDA was asked to provide $130 million. USDA has evaluated these proposals and has issued cooperative agreements to allocate $14.5 million from the CCC for fiscal year 1996. The program is limited to $2 million in the FY 1997 Appropriations Act.

Flood Risk Reduction Program. The 1996 Farm Act authorized USDA to offer flood risk reduction contracts to producers with frequently flooded contract acreage under the Agricultural Market Transition Act. FSA will administer this program. Individuals can receive up to 95 percent of projected production flexibility contract payments, under the Agricultural Market Transition Act, that the USDA estimates the producer would otherwise have received from the time of the contract though September 30, 2002. In return, producers must agree to the termination of their production flexibility contract, comply with swampbuster and conservation compliance provisions, and forgo future disaster payments, crop insurance payments, conservation program payments, and loans for contract commodities, oilseeds, and extra long staple cotton. Flood risk reduction funding is also provided through the CCC.

Conservation of Private Grazing Land Initiative. The 1996 Farm Act required USDA to conduct, subject to the availability of appropriated funds, a coordinated technical, educational, and related assistance program for owners and managers of non-Federal grazing lands including rangeland, pastureland, grazed forest land, and hay land. NRCS will conduct this Initiative. The Initiative builds on the growing public awareness of the importance of private grazing lands, which comprise nearly 642 million acres, or half the Nation's 1.4 billion acres of private land. Working through local conservation districts, the purpose of the program is to preserve water quality, improve wildlife and fish habitat, help with weed and brush problems, enhance recreational

opportunities, and improve aesthetics. The 1996 Farm Act authorized appropriations of $20 million in FY 1996 (subsequently limited to $10 million), $40 million in FY 1997, and $60 million in FY 1998 and each subsequent year.

USDA Conservation Programs Terminated by the 1996 Farm Act

Agricultural Conservation Program (ACP). Initiated in 1936 and administered by the Farm Service Agency (FSA, formerly Agricultural Stabilization and Conservation Service), ACP provided cost-sharing (up to $3,500 annually or $35,000 under 10-year agreements) and technical assistance to farmers who carried out approved conservation and environmental protection practices on agricultural land and farmsteads. During the past 20 years, outlays generally ran between $175 million and $200 million each year. The number of participants gradually declined from more than 300,000 annually in the mid-1970's to some 85,000 farmers in 1995 (table 6.1.1). Since the 1980s, an increasing amount and proportion of cost-sharing was directed to water quality practices (including those in Water Quality Program activities). In 1995, 27 percent of ACP cost-sharing went for water quality practices, up from 7 percent in 1988 (table 6.1.2). A new practice, Integrated Crop Management (ICM), was made available under ACP in 1990 and was applied on 341,000 acres in 1995. The practice includes pest scouting, nutrient testing, and other improved management practices. Authority for ACP terminated on April 4, 1996, when its functions were subsumed by EQIP, although ACP expenditures from previously obligated funds will continue to service prior long-term agreements.

Water Quality Incentive Projects (WQIP). WQIP was created by the Food, Agriculture, Conservation and Trade Act of 1990, and was administered as a practice under ACP. The goal of WQIP was to reduce agricultural pollutants by subsidizing farm management practices that restore or enhance water resources affected by agricultural nonpoint source pollution. Areas eligible for WQIP included watersheds identified by States as being impaired by nonpoint source pollution under Section 319 of the Clean Water Act; areas identified by State agencies for environmental protection and so designated by the Governor; and areas where sinkholes could convey runoff directly into groundwater. A total of 242 projects were started during FY 1993-95.

Eligible producers entered into 3- to 5-year agreements with USDA to implement approved management practices on their farm, as part of an overall water quality plan, in return for an incentive payment. The WQIP supported 39 different practices for protecting water quality. In 1995, WQIP assistance was applied on over 800,000 acres at an average incentive payment of nearly $8 per acre. WQIP was consolidated into EQIP by the 1996 Farm Act.

Great Plains Conservation Program (GPCP). GPCP, initiated in 1957 and administered by NRCS, has provided technical and financial assistance in 556 counties in the 10 Great Plains States for conservation treatment on entire operating units. Financial cost-share assistance of up to 75 percent was limited to $3,500 per person per year. Contracts were 3 to 10 years in length. In 1995, over 7,400 farms were active in the program, covering nearly 16 million acres (table 6.1.1). GPCP was terminated on April 4, 1996, when its functions were subsumed by EQIP.

Colorado River Salinity Control Program (CRSCP). Initiated in 1984, CRSCP was jointly administered by USDA and the U.S. Department of the Interior to identify salt source areas in the Colorado River Basin; assist landowners and farm operators in installing practices to reduce salinity in the Colorado River; carry out research, education, and demonstration activities; and monitor and evaluate the activities being performed. Farmers could receive up to 70 percent cost-sharing to install improved irrigation systems designed to increase irrigation efficiency and to reduce the movement of salt into groundwater. Total payments were limited to $100,000 per farm. Once an application was approved, landowners entered into a contract for 3 to 10 years. Besides agreeing to build and install the salinity control project, the landowner also agreed to operate and maintain the project. In 1995, CRSCP had 597 participants receiving an average of $38,000 (table 6.1.1). CRSCP was consolidated into EQIP under the 1996 Farm Act, although expenditures will continue to service prior contracts.

Ongoing USDA Conservation Programs[1]

Conservation Technical Assistance (CTA). Since 1936, CTA, administered by NRCS through local Conservation Districts, has provided technical assistance to farmers for planning and implementing soil and water conservation and water quality practices. Farmers adopting practices under USDA conservation programs and other producers who ask

[1] Water quality programs, the Conservation Reserve Program, Conservation Compliance, and wetland programs are discussed in subsequent chapters.

Table 6.1.1—Status of selected USDA conservation programs, fiscal 1989-95

Program[1]	1989	1990	1991	1992	1993	1994	1995
Agricultural Conservation Program:							
Number of participants (thousand)	124.4	123.8	123.9	120.2	114.9	122.4	84.8
Average assistance per participant ($) [2]	1,480	1,608	1,470	1,580	1,685	1,659	1,679
% technical / % cost-sharing [4]	6/94	6/94	6/94	6/94	6/94	6/94	10/90
Conservation Technical Assistance:							
Cooperators assisted (million)	1.3	1.8	1.2	1.2	1.2	1.0	0.7
Cooperators applying practices (million)	1.0	0.4	0.9	0.5	0.5	0.4	0.3
Resource management system acres (million)	25.2	27.4	18.4	18.0	15.9	16.5	17.8
Acres serviced by CTA (million)	62.6	60.7	59.6	59.6	62.1	57.2	37.0
Extension Education:							
Water Quality Program FTE [3]	NA	NA	NA	698	711	748	764
(% of total)				(4.3%)	(4.5%)	(4.7%)	(4.9%)
Sustainable Agr. Initiative FTE	NA	NA	NA	634	635	623	640
(% of total)				(4.0%)	(4.0%)	(3.9%)	(4.1%)
Great Plains Conservation Program:							
Total active contracts (whole farm units)	5,129	5,443	5,779	6,336	6,761	6,761	7,419
New contracts during year	953	971	1,047	1,185	1,129	1,166	483
Applications awaiting funding	1,725	1,909	2,580	2,680	2,599	2,599	2,551
Acres under active contracts (million)	15.2	16.6	15.1	19.4	19.9	15.7	15.8
Counties covered in 10 States	518	518	518	556	556	556	556
Avg. cost/new contract ($1,000) [2]	21	22	23	21	22	22	22
% technical / % cost-sharing	40/60	38/62	33/67	36/64	35/65	35/65	35/65
Forestry Incentives Program:							
Number of participants	5,048	4.760	5,417	5,179	5,467	5,614	4,520
Acres treated (1,000)	198	187	215	208	214	227	166
Average assistance per acre [2]	$62	$61	$63	$61	NA	$54	$56
Average assistance per participant/year [2]	$2,436	$2,394	$2,511	$2,452	$2,268	$2,423	$2,276
% technical / % cost-sharing	10/90	11/89	9/91	10/90	10/90	10/90	10/90
Emergency Conservation Program:							
Number of farms assisted	4,861	8,958	6,877	4,907	4,929	12,515	9,227
Acres served (million)	2.5	1.1	1.0	1.0	1.4	0.93	0.87
Avg. assistance per acre[2]	$3	$17	$9	$11	$31	$41	$33
Colorado River Salinity Control Program:							
Participants	127	172	214	349	527	517	597
States with participants	3	3	3	3	3	3	3
Avg. assistance per participant ($1,000) [2]	43	60	69	42	26	28	38
Conservation Loans and Easements:							
Soil and water loans:							
(million $)	5.9	6.1	5.5	2.7	2.3	3.7	0
(number)	360	247	206	138	123	157	0
Conservation easements	266	388	114	84	120	167	69
Acres in easements	20,980	33,280	10,310	8,340	17,580	24,380	5,690
Properties transferred for conservation purpose--							
Number	14	9	141	73	79	54	56
Acres	4,047	8,954	50,447	21,692	21,090	13,392	13,351
Small Watershed Program:							
Projects authorized for planning	18	18	11	35	33	33	17
Projects authorized for installation	19	19	23	11	22	22	17
Obligations for planning (million $)	8.4	8.6	8.9	9.2	9.5	11.1	10.5
Obligations for installation (million $)	137.0	130.1	140.8	144.2	158.3	179.9	71.8
Resource Conservation and Development Program:							
Active areas (number)	189	194	209	236	250	275	277
State and local funding (million $)	NA	108.1	160.5	131.1	75.1	43.5	20.8
State and local funding per Federal $	NA	$3.96	$5.37	$4.03	$2.31	$13	$14

NA = Not available. [1] For Federal expenditures on technical and cost-sharing assistance, see table 6.1.3.

[2] Includes both technical and cost-sharing assistance. [3] Full-time equivalents.

[4] Technical assistance paid from ACP funding. In addition, NRCS used funds appropriated for conservation operations to finance ACP-related technical assistance.

Source: USDA, ERS, based on annual program reports of the various agencies and Office of Budget and Program Analysis data.

Table 6.1.2—Agricultural Conservation Program (ACP) expenditures by primary purpose, fiscal 1988-95

Primary purpose	Cost-share expenditures							Percent of total						
	1988	1990	1991	1992	1993	1994	1995	1988	1990	1991	1992	1993	1994	1995
	$million							*Percent*						
Erosion control	133.8	112.2	111.5	106.3	93.7	107.0	70.1	71.2	64.7	61.7	58.9	55.6	55.9	51.3
Water conservation	27.7	24.7	23.6	22.8	22.5	25.0	17.3	14.7	14.3	13.0	12.6	13.3	13.1	12.7
Surface water quality (SWQ):														
Sediment	1.7	3.5	4.9	5.9	5.7	5.9	4.8	0.9	2.0	2.7	3.3	3.4	3.1	3.5
Animal waste	6.8	13.8	18.4	20.5	20.9	24.9	20.6	3.6	7.9	10.2	11.3	12.4	13.0	15.1
Fertilizer	1.4	2.8	4.8	5.8	5.9	8.1	6.5	0.7	1.6	2.7	3.2	3.5	4.3	4.7
Toxics	0.4	0.3	0.6	1.1	1.1	1.7	1.8	0.2	0.2	0.3	0.6	0.7	0.9	1.3
Salinity	2.4	1.2	0.8	0.9	1.0	1.1	1.1	1.3	0.7	0.4	0.5	0.6	0.6	0.8
Other SWQ	0.7	0.8	1.0	2.5	3.3	2.5	1.7	0.4	0.5	0.6	1.4	2.0	1.3	1.3
Subtotal SWQ	13.4	22.4	30.5	36.7	38.0	44.2	36.6	7.1	12.9	16.9	20.3	22.6	23.1	26.8
Ground water quality	0.3	0.3	0.4	0.4	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.2
Energy	0.9	1.1	1.2	1.2	1.4	1.5	1.4	0.5	0.6	0.7	0.7	0.8	0.8	1.0
Wildlife	1.3	1.3	1.5	1.4	1.1	1.4	1.0	0.7	0.7	0.8	0.8	0.7	0.7	0.8
Wood production	9.1	9.9	10.9	10.2	9.8	10.1	8.4	4.8	5.7	6.0	5.7	5.8	5.3	6.1
All other	1.5	1.5	1.2	1.5	1.9	1.8	1.5	0.8	0.9	0.7	0.8	1.1	0.9	1.1
Total[1]	188.0	173.4	180.8	180.5	168.7	191.3	136.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] These data differ slightly from the more recent information in table 6.1.3, but are the only available source of expenditures by primary purpose.
Source: USDA, ERS, based on ASCS, Annual Statistical Summaries of the Agricultural Conservation Program.

for assistance in adopting approved NRCS practices can receive technical assistance. In 1995, CTA provided assistance to approximately 700,000 cooperators on about 37 million acres (table 6.1.1), down from earlier years. In recent years, CTA has prepared and assisted in implementing conservation plans for highly erodible lands to help farmers maintain eligibility for USDA program benefits.

Water Bank Program (WBP). Authorized in 1970, the WBP is primarily designed to preserve, restore, and improve high-priority wetlands. In the process, WBP also provides habitat for migratory waterfowl and other wildlife, improves water quality, reduces soil erosion, conserves surface waters, improves subsurface moisture, contributes to flood control, and enhances the natural beauty of the landscape. Under the WBP, USDA enters into agreements with landowners and operators in important migratory waterfowl nesting, breeding, and feeding areas for the conservation of specified wetlands. The agreements are for 10 years with provision for renewal. The program operates primarily in the northern part of the central flyway, and the northern and southern parts of the Mississippi flyway. Until 1994, the WBP was administered by FSA, after which the program became the responsibility of NRCS. In 1995, approximately 700,000 acres were in the program with annual payments of nearly $10 million. North Dakota, Mississippi, Arkansas, and South Dakota had the most acres enrolled of 12 States.

Congressional appropriators eliminated funding for the WBP in FY 1995, reflecting deficit reduction pressures. As a result, payments to farmers end as their 10-year contracts expire and no additional acres can be enrolled in the program. However, certain lands subject to expiring WBP contracts are eligible for possible enrollment in the CRP.

Emergency Conservation Program (ECP). ECP was initiated in 1978 and is administered by FSA. The program provides financial assistance to farmers in rehabilitating cropland damaged by natural disasters and for conserving water during severe drought. There is a payment limit of $200,000 per person per disaster. Expenditures jumped in 1993-95 as a result of numerous hurricanes, floods, drought, and tornados (table 6.1.3).

Emergency Watershed Protection Program. This program was initiated in 1950 and is administered by NRCS. It provides technical and financial assistance to local institutions for removal of storm and flood debris from stream channels and for restoration of stream channels and levees to reduce threast to life and property. Local institutions receiving aid must contribute 25 percent of total cost. Expenditures in 1994 and 1995 rose because of special appropriations to help the Midwest recover from the 1993 flood.

Extension Education. The Cooperative State Research, Extension, and Education Service

Table 6.1.3—USDA conservation expenditures, by activity and program, fiscal years 1983-97[1]

Activity/program	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995 actual	1996 approp.	1997[2] request
1. Technical assistance, extension, and administration:															
Natural Resources Conservation Service (NRCS)								*$ million*[1]							
Conservation Technical Assistance (CTA)	276.9	293.7	302.0	286.7	332.0	366.4	386.7	396.7	426.5	477.9	515.2	523.2	500.0	538.9	565.4
Great Plains Conservation Program (GPCP)	9.1	9.1	9.1	8.9	9.1	8.7	8.2	8.0	8.3	9.1	8.9	9.3	9.1	0.0	0.0
Resource Conservation & Development (RC&D)	16.3	16.3	17.8	17.4	17.8	18.2	18.4	23.1	24.2	26.0	29.9	28.3	30.4	29.0	29.4
Small Watershed Program (planning)	8.9	8.7	8.9	8.5	8.7	8.7	8.7	8.8	9.2	9.5	9.5	10.9	10.5	5.6	7.7
Watershed Protection / Flood Prevention	101.6	75.7	76.9	77.8	68.1	67.7	65.9	63.2	70.3	74.3	80.4	77.9	70.0	60.0	76.0
Colorado River Salinity Control Program	0.0	0.0	0.0	0.0	1.4	1.8	2.0	4.4	5.9	5.9	5.5	5.5	3.9	0.3	0.2
Forestry Incentives Program (FIP)	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3	0.7	0.6	0.6
Water Bank Program (WBP)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.7	1.1	1.1	0.4	0.0	0.0	0.0
Wetland Reserve Program (WRP)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	3.5	8.8	6.0	17.0
Subtotal NRCS	414.0	404.8	416.0	400.5	438.2	472.6	491.2	506.0	546.4	605.0	656.7	660.3	633.4	640.4	696.2
Farm Service Agency (FSA)															
Agricultural Conservation Program (ACP)	11.0	11.2	11.2	10.5	9.3	11.2	10.1	11.3	10.6	10.8	11.2	11.7	6.0	4.5	4.5
Conservation Reserve Program (CRP)	0.0	0.0	0.0	10.8	21.9	5.6	27.9	16.4	5.7	11.4	8.9	4.7	5.3	6.6	21.4
Emergency Conservation Program (ECP)	0.1	0.7	0.6	0.2	0.1	0.2	0.4	0.6	0.5	0.8	1.5	1.0	1.8	0.0	0.0
Rural Clean Water Program (RCWP)	-0.9	0.3	0.0	3.4	2.5	0.0	-0.7	0.9	0.8	0.4	0.0	0.0	0.0	0.0	0.0
FSA salaries & expenses, conservation	32.8	35.3	33.1	37.3	47.6	61.4	62.4	60.2	73.8	72.6	65.3	67.6	62.8	62.8	62.8
Subtotal FSA	43.0	47.4	44.9	62.0	81.4	78.4	100.1	89.4	91.4	96.1	87.0	85.0	75.9	73.9	88.7
Extension Service (ES) conservation activities	15.9	16.0	16.4	16.3	15.7	18.1	19.8	23.5	29.4	31.1	31.1	32.2	32.2	31.7	31.7
Forest Service (FS)															
Forest Stewardship	10.3	6.9	6.9	6.7	7.1	6.8	6.8	15.2	22.6	23.9	23.3	25.8	25.9	23.4	30.0
Economic Action Programs	2.6	1.2	1.0	0.9	1.0	2.0	1.0	4.2	10.2	15.2	13.7	15.5	16.0	14.5	15.0
Forest Legacy Program	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	9.9	6.9	0.0	3.0	3.0
Pacific Northwest Assistance	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.4	17.1	16.0	13.0
Urban and Community Forestry	1.5	1.6	2.0	1.9	1.9	2.0	2.5	2.8	21.1	23.8	24.8	27.0	28.3	25.5	26.0
Subtotal Cooperative Forest Conservation	4.1	2.8	2.9	2.8	3.0	4.0	3.5	6.9	31.2	44.0	48.4	65.9	61.4	59.0	57.0
Subtotal FS	14.4	9.7	9.8	9.5	10.0	10.8	10.3	22.1	53.8	67.9	71.7	91.7	87.3	82.4	87.0
Subtotal Tech. asst., ext., and admin.	487.4	477.9	487.1	488.4	545.4	579.9	621.3	641.1	721.1	800.1	846.4	869.2	828.8	828.5	903.7
2. Cost-sharing for practice installation:															
FSA															
Agricultural Conservation Program (ACP)	176.5	174.5	179.2	129.7	172.6	186.6	174.0	187.8	171.6	179.1	182.8	183.0	94.0	70.5	70.5
Conservation Reserve Program (CRP)	0.0	0.0	0.0	12.4	245.6	284.8	182.3	118.1	40.9	39.3	32.0	14.5	3.7	25.1	66.1
Emergency Conservation Program (ECP)	13.9	16.4	4.9	6.6	5.3	5.7	6.1	17.9	8.8	10.3	42.0	24.0	21.2	0.0	0.0
Rural Clean Water Program (RCWP)	2.5	0.0	1.9	10.6	0.0	2.1	0.8	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal FSA	193.0	190.9	185.9	159.3	423.5	479.3	363.1	324.1	221.3	228.7	256.8	221.5	118.9	95.6	136.6

--Continued

Table 6.1.3—USDA conservation expenditures, by activity and program, fiscal years 1983-97[1], continued

Activity/program	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995 actual	1996 approp.	1997[2] request
								$ million[1]							
FS Stewardship Incentives Program (SIP)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.9	0.8	17.8	17.9	18.3	4.5	20.0
NRCS															
Colorado River Salinity Control Program	0.0	0.0	0.0	0.0	2.5	3.1	3.4	6.0	8.9	8.8	8.2	8.2	0.6	2.4	2.5
Forestry Incentives Program (FIP)	11.3	11.1	11.5	9.8	10.7	10.6	11.1	10.2	12.4	11.5	11.2	11.5	6.0	5.7	5.7
Great Plains Conservation Program (GPCP)	12.2	12.3	12.5	11.5	11.4	11.8	12.2	12.9	16.4	16.2	16.4	16.4	6.1	0.0	0.0
Wetland Reserve Program (WRP)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	7.4	9.9	8.0	20.6
Subtotal NRCS	23.6	23.4	24.0	21.4	24.6	25.5	26.7	29.1	37.6	36.5	35.8	43.5	22.5	16.1	28.7
Subtotal Cost-sharing	216.5	214.3	209.9	180.7	448.1	504.8	389.9	353.2	278.8	266.0	310.4	282.9	159.7	116.2	185.4
3. Public works project activities (NRCS):															
Emergency Watershed Protection	22.5	22.0	5.0	79.7	14.8	13.5	10.0	94.9	20.0	70.0	73.1	133.2	290.6	0.0	15.0
Flood Prevention (operations)	22.7	9.9	13.9	19.1	11.5	11.3	12.8	16.0	12.8	21.4	23.8	22.9	0.0	6.0	0.0
Resource Conservation and Development (RC&D)	14.4	9.7	8.5	7.7	7.2	7.06.7	4.2	5.7	6.5	2.6	4.6	2.5	0.0	0.0	
Small Watershed Program (operations)	160.6	87.6	88.0	80.8	82.7	83.4	83.7	81.7	82.6	89.6	101.3	106.9	0.0	34.0	40.0
Subtotal NRCS public works projects	220.3	129.1	115.4	187.3	116.2	115.2	113.2	196.8	121.1	187.5	200.8	267.6	293.1	40.0	55.0
4. Rental and easement payments (FSA & NRCS):															
Conservation Reserve Program (CRP)	0.0	0.0	0.0	0.0	410.0	760.1	1162.1	1393.7	1590.1	1612.5	1510.0	1728.8	1711.7	1750.0	1837.3
Water Bank Program (WBP)	8.8	8.8	8.8	8.4	8.4	8.4	9.0	12.2	13.1	17.1	17.1	7.4	0.9	0.0	0.0
Wetland Reserve Program (WRP)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	86.9	78.8	58.0	150.5
Subtotal rental and easement payments	8.8	8.8	8.8	8.4	418.4	768.5	1171.1	1406.0	1603.2	1629.6	1531.5	1823.0	1791.4	1808.0	1987.7
5. Conservation data and research:															
Agricultural Research Service	63.5	63.7	63.7	62.4	59.3	60.5	65.9	73.6	73.6	73.9	74.3	76.7	75.5	76.1	79.7
Cooperative State Research Service	27.9	29.6	32.8	31.3	31.0	33.1	34.5	40.6	50.6	53.9	49.8	48.0	50.1	48.2	45.6
Economic Research Service	5.0	7.7	5.4	4.0	4.0	3.1	3.0	4.6	5.5	5.8	6.3	5.0	5.0	5.0	5.0
Forest Service (forest research)	107.7	109.4	121.7	120.1	132.7	135.5	138.3	150.9	167.6	180.5	182.7	195.0	193.5	178.0	179.8
National Agricultural Library (water quality)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
NRCS programs															
River basin surveys	16.4	15.6	14.9	14.2	12.1	12.1	12.1	12.3	12.8	13.3	13.3	13.5	13.0	8.4	11.5
Soil surveys	51.4	53.5	54.8	54.3	58.2	67.7	68.2	68.1	69.8	72.6	72.6	73.9	72.6	76.6	77.7
Plant materials centers	3.8	4.0	4.1	3.9	4.6	4.9	5.0	7.2	7.9	8.1	8.1	8.9	8.1	8.9	9.0
Snow surveys	3.8	3.9	4.0	3.8	5.0	5.4	5.5	5.4	5.6	5.7	5.7	5.8	5.6	5.9	5.9
Subtotal NRCS	75.47	77.02	77.78	76.19	79.74	90.00	90.79	92.98	96.03	99.58	99.58	102.10	99.32	99.73	104.03
Subtotal conservation data and research	279.5	287.4	301.3	294.0	306.8	322.2	332.5	363.0	393.7	413.9	413.0	427.2	423.7	407.3	414.4
6. Conservation compliance and sodbuster (FSA & NRCS) (expenditures are included in other programs listed above):															
USDA total	1212.5	1117.5	1122.6	1158.7	1834.8	2290.5	2627.9	2960.0	3117.8	3297.2	3302.2	3669.9	3496.8	3200.0	3546.2

[1] Derived from material provided by the Office of Budget and Program Analysis (OBPA) USDA. [2] Based on Administration's request prior to passage of the 1996 Farm Act. Does not inlcude new programs created by the 1996 Act.

(CSREES) provides information and recommendations on soil conservation and water quality practices to landowners and farm operators in cooperation with the State Extension Services and State and local offices of USDA agencies and Conservation Districts. In 1995, about 5 percent of extension education effort was directed to USDA's Water Quality Program activities, and 4 percent to sustainable agriculture (table 6.1.1).

Conservation Loans and Farm Debt Cancellation Easements. FSA provides loans to farmers for soil and water conservation, pollution abatement, and building or improving water systems. Loan activity dropped to zero in 1995, continuing a downward trend since 1990 (table 6.1.1). FSA may also acquire voluntary conservation easements as a means of helping farmers reduce outstanding loan amounts. Only 69 easements covering 5,700 acres were acquired in 1995, one-sixth the amount of 1990. FSA places conservation easements on foreclosed land being sold, or transfers environmentally sensitive lands to Federal and State agencies for conservation purposes. In 1995, FSA approved 56 property transfers for conservation purposes covering 13,351 acres.

Forestry Incentives Program (FIP). FIP was initiated in 1975 and provides cost-sharing up to 65 percent for tree planting and timber stand improvement for private forest lands of no more than 1,000 acres. Maximum payment per owner is $10,000 annually, but payments in 1995 averaged about $2,300 (table 6.1.1). More than 4,500 forest owners participated in the program in 1995, with 166,000 acres enrolled. NRCS administers the program and the Forest Service (FS) provides technical assistance.

Forest Stewardship Program (FSP). FSP was enacted in 1990 and is administered by the Forest Service. The program provides grants to State forestry agencies for expanding tree planting and improvement and for providing technical assistance to owners of nonindustrial private forest lands in developing and implementing forest stewardship plans to enhance multi-resource needs. A companion ***Stewardship Incentive Program (SIP)***, administered by the Forest Service through FSA, provides cost-sharing up to 75 percent for practices in the approved forest stewardship plans. Payments may not exceed $10,000 annually per landowner and practices must be maintained for at least 10 years.

Pesticide Record-Keeping. This provision established by the 1990 Farm Act requires private applicators of restricted-use pesticides to maintain records accessible to State and Federal agencies regarding products applied, amount, and date and location of application. The requirement became effective May 10, 1993, and is administered by the Agricultural Marketing Service.

Resource Conservation and Development Program (RC&D). RC&D was initiated in 1962. Through this program, NRCS assists multicounty areas in enhancing conservation, water quality, wildlife habitat, recreation, and rural development. The program provides technical and limited financial assistance for planning and installation of approved projects. In 1995, 277 active areas existed, up slightly from 1994 (table 6.1.1). During 1994-95, $13-$14 of State and local funds supplemented each dollar of Federal funding, up significantly from earlier years.

Small Watershed Program. Otherwise known as PL-566, this program was initiated in 1954. It assists State agencies and local units of government in flood prevention, watershed protection, and water management. Part of this effort involves establishment of measures to reduce erosion, sedimentation, and runoff. The program provides up to 100 percent of the construction costs for structural measures with flood prevention purposes and up to 50 percent of such costs for structural measures with other purposes. The program also provides 75 percent of the installation cost for nonstructural measures. Eligible watersheds must be 250,000 acres or less in size. In 1995, 34 local projects were authorized, down from earlier years (table 6.1.1). NRCS administers the program and provides technical assistance.

Data and Research Activities. The Agricultural Research Service (ARS) conducts research on new and alternative crops and agricultural technology to reduce agriculture's adverse impacts on soil and water resources. CSREES administers competitive grants and coordinates conservation and water quality research conducted by State Agricultural Experiment Stations and land-grant universities. The Economic Research Service (ERS) estimates economic impacts of existing and alternative policies, programs, and technology for preserving and improving soil and water quality; and with the National Agricultural Statistics Service (NASS), collects data on farm chemical use, agricultural practices, and costs and returns. The Forest Service (FS) conducts research on environmental and economic impacts of alternative forest management policies, programs, and practices. NRCS conducts river basin studies, soil surveys, snow surveys, and National Resource Inventories; it also supports plant materials centers.

Table 6.1.4—Resource conservation and related programs affecting agriculture, FY 1996 estimated expenditures

Agency and program	FY 1996 estimated expenditure
	$ Million
U.S. Department of Agriculture (USDA) programs:	
Conservation Reserve Program (CRP)	1,782
Wetlands programs	72
Water Quality Program	193
Other conservation	1,153
USDA total	3,200
U.S. Environmental Protection Agency (EPA) programs: [1]	
Water quality programs	526
Drinking water programs	184
Pesticide programs	109
EPA total	819
Army Corps of Engineers programs: [1]	
Dredge and Fill Permit Program (wetlands)	101
Flood control programs	1,252
Corps total	1,353
U.S. Department of the Interior (USDI) programs: [1]	
Range improvement	10
Water development and management	982
Water resources investigations	186
Wetlands conservation	7
Endangered species conservation	36
Natural resources research	148
USDI total	1,369
Federal total	6,741
State and local expenditures on USDA cooperative conservation programs	736

[1] Programs affect other resources as well as agriculture.

Sources: USDA, ERS, based on data from Office of Management and Budget; and USDA, Office of Budget and Program Analysis.

USDA Conservation Program Expenditures

Resource conservation and environmental programs or activities administered by USDA had estimated expenditures in FY 96 of $3.2 billion (table 6.1.4). USDA's expenditures represent 47 percent of Federal expenditures on resource efforts affecting agriculture, estimated to be $6.7 billion in FY 96. The other major Federal players are the U.S. Department of the Interior (USDI), the Army Corps of Engineers (Corps), and the U.S. Environmental Protection Agency (EPA). USDI and Corps programs affecting agriculture primarily deal with water resource conservation and management, including irrigation, flood control, and wetlands. EPA administers programs dealing with surface-water quality, drinking water and groundwater protection, and use of pesticides (for more details, see box, "Other Federal Conservation and Environmental Programs That Affect Agriculture," p. 268-269, and chapters 3.2, 6.2, and 6.5).

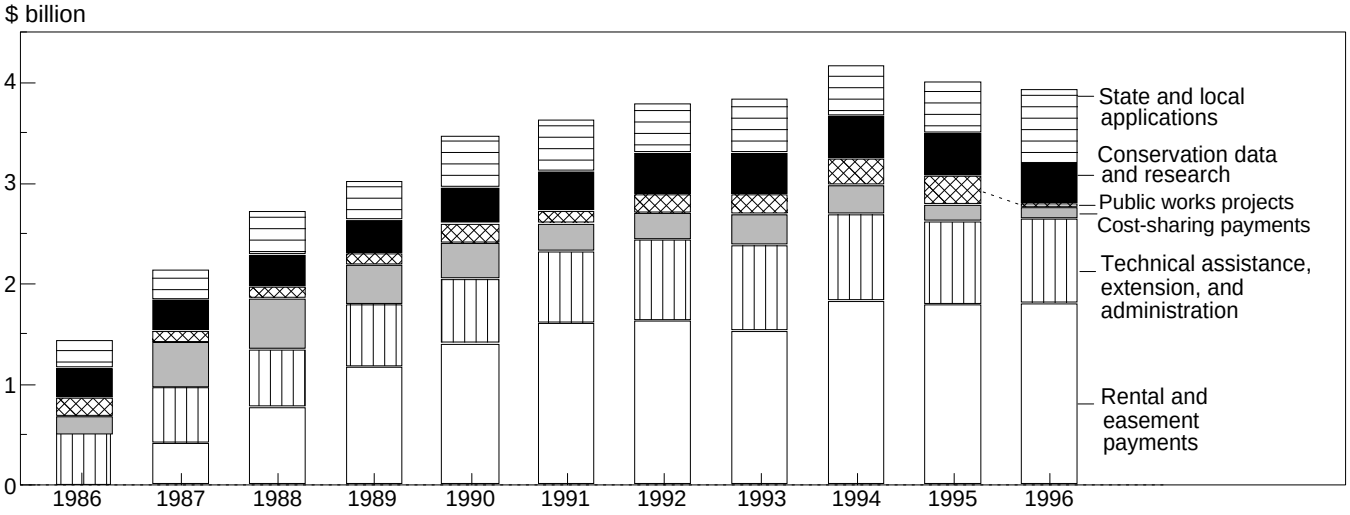
Programs administered at State and local levels also affect agriculture. All States support technical assistance for conservation and water quality through conservation or natural resource districts located at the county or multi-county level. In 1996, such support was $736 million. Also, all States fund cooperative extension education efforts and 44 States provide various incentives for farmers to use soil and water conservation and water quality practices. States and localities also provide support for cooperative regional water quality or estuary programs (see chapter 6.2, *Water Quality Programs*, for more details on State programs).

According to a Congressional Budget Office analysis, total funding committed to resource conservation under USDA conservation programs will grow by more than $2 billion over 1996-2002 ($300 million per year) as a result of the 1996 Farm Act. The 1996 Farm Act added conservation and environmental protection to the mission of the CCC charter, and provided for future funding of major conservation program such as the CRP, WRP, and EQIP through mandatory CCC allocations. For the first time, this places conservation funding on equal financial footing with commodity program funding. Although USDA must still submit an annual budget request that includes expected conservation and other spending, which is subject to an overall spending limit, funding these conservation programs through CCC should reduce the uncertainty associated with annual conservation program appropriations.

USDA Expenditures on Different Conservation Policy Approaches

Spending on conservation activities by USDA and State and local governments increased steadily until 1995 when budget tightening began occurring at all levels (fig. 6.1.1). At the Federal level, funding for ACP, GPCP, and watershed programs were cut significantly and funding was eliminated for the Water Bank Program. For 1996, USDA and related State and local government expenditures for conservation were nearly $4 billion, similar to 1995.

Figure 6.1.1--Conservation expenditures by USDA and related State and local programs, 1986-96



Source: USDA, ERS, based on Office of Budget and Program Analysis data.

Also changed has been the mix of USDA expenditures. Rental and easement payments accounted for over half of USDA conservation expenditures in 1995 (fig. 6.1.2, table 6.1.3). Since 1988, rental payments for land retired for conservation purposes have been the largest category of USDA conservation expense. The bulk of these were rental payments to participants in the Conservation Reserve Program (CRP) for land retired from production and placed into protective cover. Rental payments were also made for land enrolled in the Water Bank Program and easement payments for land accepted into the new Wetlands Reserve Program. Technical assistance and extension expenditures were $829 million in 1995 and accounted for almost 24 percent of the USDA total for conservation purposes. Only cost-sharing for practice installation, which accounted for less than 5 percent of USDA spending in 1995, was funded well below previous levels. High expenditures for public works projects reflected emergency measures required by the 1993 Midwest flood at over 8 percent of USDA spending.

The President's budget for 1997 shows declines from 1995 for public works project activities and conservation data and research but increases for technical assistance and extension, cost-sharing, and rental and easement payments. The budgeted increase in rental payments is for land expected to go into the Wetlands Reserve and re-enrollment of environmentally sensitive lands into the CRP as existing contracts expire.

Erosion and Pollutant Reductions from USDA Conservation Programs

USDA programs contribute to farmers' increasing use of management practices that reduce soil erosion and chemical applications or loads (table 6.1.5). The Water Quality Program (WQP) and the Agricultural Conservation Program (ACP) helped farmers implement integrated crop management (ICM), nutrient management, and pesticide management. According to a General Accounting Office report, during fiscal years 1992-94, USDA supported conservation measures on an average of 71 million acres under 565,000 agreements with land users annually under 10 cost-sharing programs and 7 land retirement programs. The 10 cost-sharing programs included ACP, CRSCP, ECP, FIP, GPCP, the Rural Clean Water Program, the Small Watershed Program, Soil and Water Conservation Loan Program, SIP, and WQIP. The seven land-retirement programs included CRP, the Emergency Wetland Reserve Program, conservation easements, Forest Legacy Program, Integrated Farm Management Program Option, WBP, and WRP.

USDA conservation programs have significantly reduced erosion from 1987 levels. For example, as of early 1995, the CRP had converted 36.4 million cropland acres to protective cover, reducing annual cropland erosion by an estimated 690 million tons (table 6.1.6). This was a drop of over one-fifth in annual cropland erosion from the 1987 level of 3 billion tons (see chapter 6.3, *Conservation Reserve Program*, for more detail). Compared with 1987,

Table 6.1.5—Major practices implemented under USDA conservation programs, fiscal 1988-95

Practice and program[1]	1988	1989	1990	1991	1992	1993	1994	1995
				Million acres treated				
Grass cover establishment:								
ACP	0.65	0.61	0.58	0.61	0.59	0.53	0.71	0.38
CRP	7.36	4.27	3.02	0.33	0.79	0.78	0	0
Grass cover improvement:								
ACP	1.37	1.17	0.96	1.00	1.00	1.12	1.25	0.88
CRP	0.47	0.29	0.17	0.04	0.09	0.11	0	0
Tree planting:								
ACP	0.16	0.13	0.12	0.13	0.12	0.13	0.13	0.20
CRP	0.50	0.41	0.19	0.09	0.10	0.12	0	0
FIP	0.16	0.16	0.15	0.18	0.16	0.18	0.19	0.14
Wildlife habitat establishment:								
ACP	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02
CRP	0.39	0.31	0.65	0.01	0.01	0.01	0	0
Cropland protective cover:								
ACP	0.75	0.64	0.58	0.61	0.65	0.48	0.41	0.02
Conservation tillage:								
ACP	0.45	0.33	0.43	0.41	0.56	0.60	0.53	0.21
WQP regional activities	NA	NA	NA	0.42	0.48	NA		
Strip cropping systems: ACP	0.14	0.12	0.15	0.12	0.10	0.08	0.07	0.05
Integrated crop management: ACP	--	--	0.03	0.20	0.28	0.32	0.38	0.34
Nitrogen management:[2]								
WQP Demo projects	0	0	NA	0.01	0.22	0.46	NA	NA
WQP HUA projects	0	0	NA	0.20	0.44	0.46	NA	NA
WQP regional activities	NA	NA	NA	0.13	0.19	NA	NA	NA
Phosphorus management:[2]								
WQP Demo projects	0	0	NA	0.01	0.13	0.25	NA	NA
WQP HUA projects	0	0	NA	0.07	0.43	0.25	NA	NA
Pesticide management:[2]								
WQP Demo projects	0	0	NA	0.04	0.08	0.18	NA	NA
WQP HUA projects	0	0	NA	0.13	0.58	0.18	NA	NA
WQP Chesapeake Bay	NA	NA	NA	0.22	0.25	NA	NA	NA
				Million acres served				
Grazing land protection: ACP	3.60	3.77	4.72	3.33	3.66	2.85	2.68	2.13
Irrigation water conservation: ACP	0.82	0.77	0.69	0.77	0.69	0.80	0.85	0.52
Terraces and diversions: ACP	1.07	0.93	0.62	0.70	0.75	0.62	0.80	0.65
Water impoundments: ACP	0.27	0.27	0.22	0.19	0.14	0.14	0.12	0.09
Sediment control structure: ACP	0.25	0.22	0.21	0.22	0.20	0.18	0.19	0.16
Sod waterways: ACP	0.22	0.17	0.18	0.26	0.20	0.16	0.26	0.16
				Number				
Agricultural waste systems:[2]								
ACP	1,947	1,753	2,348	2,912	3,844	4,108	4,116	3,132
WQP Demo projects	0	0	NA	123	162	NA	NA	NA
WQP HUA projects	0	0	NA	200	325	NA	NA	NA
WQP regional activities	NA	NA	NA	581	74	NA	NA	NA
Wellhead protection:								
WQP Demo projects	0	0	NA	62	463	NA	NA	NA
WQP HUA project	0	0	NA	2,304	1,553	NA	NA	NA

[1] ACP = Agricultural Conservation Program. CRP = Conservation Reserve Program. FIP = Forestry Incentives Program. HUA = Hydrologic Unit Area. WQP = Water Quality Program. No data available for programs or projects not listed.

[2] Some of the practices implemented in the WQP in 1991 and 1992 were cost-shared under ACP and are duplicative.

NA = Not available.

Source: USDA, ERS, based on annual reports of the various programs.

Table 6.1.6—Impacts of USDA conservation programs on erosion and chemicals, fiscal 1988-95[1]

Impact and program	1988	1989	1990	1991	1992	1993	1994	1995
				Million tons				
Erosion reduced/soil saved by:								
Conservation Reserve Program[2]	514	596	644	654	672	692	692	692
Conservation compliance[3]	0	0	0	NA	236	458	465	527
Agricultural Conservation Program[4]	40	34	33	34	30	29	29	18
Conservation Technical Assistance and GPCP[4, 5]	463	353	353	282	298	321	325	284
Annual Acreage Reduction Program[4, 6]	107	62	55	60	39	46	29	40
WQP regional activities	NA	NA	NA	2	NA	NA	NA	NA
				Million lbs.				
Nitrogen application reduced by:								
WQP Demo projects[4]	NA	NA	NA	0.9	8.9	NA	NA	NA
WQP HUA projects[4]	NA	NA	NA	1.7	38.5	NA	NA	NA
WQP regional activities[4]	NA	NA	NA	8.1	5.9	NA	NA	NA
Phosphorus application reduced by:								
WQP Demo projects[4]	NA	NA	NA	0.2	7.3	NA	NA	NA
WQP HUA projects[4]	NA	NA	NA	1.5	57.4	NA	NA	NA
WQP regional activities[4]	NA	NA	NA	4.4	5.8	NA	NA	NA
				1,000 tons				
Salt load reduced by:								
Colorado River Salinity Control Program[2]	62	75	92	105	127	163	191	212
				1,000 lbs. active ingredient				
Pesticide load reduced by:								
WQP Demo projects[4]	NA	NA	NA	48	66	NA	NA	NA
WQP HUA projects[4]	NA	NA	NA	191	462	NA	NA	NA

NA = Not available.

[1] No data or estimates available for programs not listed. The erosion reductions are estimates based on long-term national weather patterns, and do not reflect annual variations in weather.

[2] All lands treated by program, including those first treated in past years with practices that are still effective.

[3] Minimum estimate based on 18, 35, 46, and 54 million acres of additional lands with a conservation plan fully implemented for 1992-95 respectively, excluding land in the CRP or land eroding at or below the soil loss tolerance (T) level in 1987. The average erosion reduced was assumed to be approximately 10 tons/acre/year, based on SCS status reviews of HEL-determined fields with a fully implemented plan, excluding those in the CRP.

[4] Reduction on lands newly treated during year only. No estimates exist of continuing reductions on lands treated in prior years.

[5] Includes partial double counting with CRP, compliance, and ACP programs.

[6] Assumes average reduction of 2 tons/acre/year. While this is a commodity program, idling the land and reducing cultivation preserves soil that would otherwise erode.

Source: USDA, ERS, based on annual program reports of the various agencies.

Conservation Compliance (see chapter 6.4, *Conservation Compliance*) was estimated to reduce soil erosion an additional 18 percent or 572 million tons as of 1995 (excluding acreage going into the CRP or already eroding at or below the tolerance level).

USDA programs are also reducing and improving fertilizer and pesticide use, thereby reducing chemicals entering surface and ground waters. Lands in the CRP receive lower applications of fertilizer and pesticides than if they had remained active cropland. WQP participants who implement improved nutrient management use less nitrogen and less phosphorus (table 6.1.6). Pesticide applications have also fallen. These reductions, although insignificant compared with total use in the United States, can improve water quality in environmentally sensitive areas. The Colorado River Salinity Control Program reduced the salt load entering the river by an estimated 212,000 tons in 1995. The downstream benefits (reduction in damages caused by salinity) have been estimated to be at $38 - $70 annually per ton of salt reduction, or $8 - $15 million for 1995.

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Other Federal Conservation and Environmental Programs That Affect Agriculture

The Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers, and the U.S. Department of the Interior administer programs that affect resource use in agriculture. In some cases, these programs limit farmers' management decisions by restricting land use, chemical use, water use, and cropping practices.

EPA-Administered Programs

Clean Water Act is the Nation's most important water quality protection law. Originally passed in 1972, the Act's goal is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The Act contains a number of provisions that affect agriculture (see chapter 6.2, *Water Quality Programs*, for more detail on the following programs).

Clean Lakes Program, reauthorized by Section 314 of the Clean Water Act, authorizes EPA grants to States for lake classification surveys, diagnostic/feasibility studies, and for projects to restore and protect lakes.

Nonpoint Source Program, established by Section 319 of the Clean Water Act, requires States and U.S. territories to identify navigable waters that cannot attain water quality standards without reducing nonpoint source pollution and develop management plans to reduce nonpoint source pollution.

National Estuary Program, established by Section 320 of the Clean Water Act, provides for the identification of nationally significant estuaries that are threatened by pollution; for preparation of conservation and management plans; and for Federal grants to State, interstate, and regional water pollution control agencies to implement the plans.

National Pollutant Discharge Elimination System (NPDES) Permit Program, established by Section 402 of the Clean Water Act, controls point-source discharges from treatment plants and industrial facilities (including large animal and poultry confinement operations).

Coastal Nonpoint Pollution Control Programs. In 1990, amendments to the Coastal Zone Management Act, administered by the National Oceanic and Atmospheric Administration and EPA, required that States with coastal zone management programs develop and implement programs to control nonpoint sources of pollution.

Regional programs for addressing water quality problems exist as cooperative efforts among State agencies, EPA, and USDA.

Safe Drinking Water Act (SDWA) requires the EPA to set standards for drinking water quality and requirements for water treatment by public water systems. Also, SDWA requires States to establish a wellhead protection program to protect public water system wells from contamination by chemicals, including pesticides, nutrients, and other agricultural chemicals.

Pesticide programs, established by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), provide the legal basis under which pesticides are regulated. A pesticide can be restricted or banned if it poses unacceptable risks to human health or the environment. The re-registration process, mandated in 1988 for all active ingredients then on the market, has resulted in manufacturers dropping many less profitable products rather than paying the registration fees. (See chapter 3.2, *Pesticides*, for more discussion.)

Comprehensive State Ground-Water Protection Program (CSGWPP), initiated by EPA in 1991, coordinates operation of all Federal, State, tribal, and local programs that address groundwater quality. States have the primary role in designing and implementing CSGWPP's in accordance with distinctive local needs and conditions.

Continued--

Other Federal Conservation and Environmental Programs That Affect Agriculture (cont.)

U.S. Army Corps of Engineers-Administered Programs

Dredge and Fill Permit Program, established by Section 404 of the Clean Water Act, regulates dredging, filling, and other alterations of waters and wetlands, including wetlands owned by farmers. USDA has authority to make wetland determinations on agricultural land. (Discussed more in chapter 6.5, *Wetlands Programs*.)

Flood control activities include the construction, rehabilitation, and operation of dams, levees, and other facilities for flood control. An emergency supplemental appropriation in 1994 provided funds to complete repair of non-Federal levees damaged by the Midwest floods of 1993. (Discussed more in chapter 6.5, *Wetlands Programs*.)

U.S. Department of the Interior-Administered Programs

Endangered Species Act is the Nation's chief statute to conserve endangered or threatened species and their ecosystems. When a species is designated as threatened with extinction, a recovery plan is developed to protect it from further population declines. The plan could include restrictions on cropping practices, water use, and pesticide use. (Discussed more in chapter 1.2, *Land Tenure*.)

Endangered Species Conservation provides State grants for the conservation of threatened and endangered species and for monitoring the status of candidate species.

Range Improvements, including rehabilitation and protection, are undertaken by the Bureau of Land Management with a percentage of receipts from grazing of livestock on the public lands.

Water Development and Management activities in the 17 Western States by the Bureau of Reclamation include construction, rehabilitation, and operation of dams and facilities for water conservation, irrigation, municipal and industrial use, flood control, recreation, and electric power generation. (Discussed more in chapter 2.1, *Water Use and Pricing*.)

Water Resources Investigations by the U.S. Geological Survey include monitoring and appraisals of the Nation's water resources to support Federal, State, and local government decisions on water development, management, and quality; and energy development.

Wetlands Conservation includes obtaining real property interest in lands or waters, the restoration or enhancement of habitat, and training and development for wetlands management. (Discussed more in chapter 6.5, *Wetlands Programs*.)

6.2 Water Quality Programs

Several approaches for protecting water quality have been developed at the Federal and State levels. These approaches use a variety of incentive mechanisms for reducing pollution discharges. Pollution from factories and other point sources is controlled through regulations and penalties. In contrast, policies and programs for reducing pollution from agriculture and other nonpoint sources are mostly based on voluntary approaches providing education, technical, and cost-sharing assistance.

Contents

Water quality protection has a been a major component of U.S. environmental policy since the passage of the Federal Water Pollution Control Act of 1972 (known since as the Clean Water Act). Most of the focus of clean water legislation has been on point sources, primarily the discharge from factories and municipal sewage treatment plants. A technology- and performance-based regulatory approach has achieved substantial reductions in point source pollution. In recent years, attention has turned to nonpoint sources, primarily runoff from agricultural operations. Federal and State programs have been implemented to address agricultural source pollution. Federal water quality programs are administered by EPA and by USDA (see box, p. 271). Some EPA and State-administered programs require mandatory actions, while USDA programs are voluntary. Even with these efforts, many water quality problems remain (see chapter 2.2, *Water Quality*, for a discussion of water quality status and trends, and pollution from agriculture).

EPA Programs Affecting Agriculture

While Federal water quality laws tend to focus on point sources, they do not ignore nonpoint sources. The primary Federal law, the ***Clean Water Act*** (CWA), addresses both point and nonpoint source pollution. Pollution from point sources is subject to both (1) technology-based controls, which consist of uniform, EPA-established standards of treatment that apply to certain industries and municipal sewage treatment facilities; and (2) water quality-based controls that invoke State water quality standards for receiving waters. These standards consist of designated uses to be made of the streams and the criteria necessary to protect those uses. Individual discharge requirements are based on the effluent quality needed to ensure compliance with the water quality standards. Most States are using the technology-based approach but some, such as Oregon, Idaho, and North Carolina, are trying the water-quality based approach in some watersheds. The individual effluent limits are enforced through the National Pollutant Discharge Elimination System (NPDES) permits. Large confined animal operations (over 1,000 animal units) fall under the NPDES

Federal Water Quality Programs Affecting Agriculture in 1996

EPA-Administered Programs

Clean Water Act Programs:
- Clean Lakes Program (Section 314)
- Nonpoint Source Program (Section 319)
- National Estuary Program (Section 320)
- National Pollutant Discharge Elimination System (Section 402)

Coastal Nonpoint Pollution Control Programs

Regional Programs

Safe Water Drinking Act

Pesticide Programs

Comprehensive State Ground-Water Protection Program

USDA-Administered Programs

Agricultural Conservation Program (ACP):
- Water Quality Incentives Projects (WQIP)
- Integrated Crop Management (ICM) Practice

Conservation Technical Assistance (CTA) Program

Colorado River Salinity Control Program (CRSCP)

Water Quality Program (WQP):
- Research and development
- Education, technical, and financial assistance
- Data base development and evaluation

Farm Bill Programs (1985 and 1990):
- Conservation Compliance
- Conservation Reserve Program (CRP)
- Wetland Reserve Program (WRT)
- Integrated Farm Management Program
- Pesticide Record-Keeping

Great Plains Conservation Program

Small Watershed Program

Resource Conservation and Development Program

system. Over 6,000 operations are large enough to require an NPDES permit. However, enforcement has been a problem, and many facilities lack permits (Westenbarger and Letson, 1995).

Section 319 of the CWA calls for controls on nonpoint sources of pollution, including agriculture, but does not provide direct authorities to regulate these sources. The NPDES permit system is unsuited for nonpoint source pollution because discrete discharge points cannot be observed. Because of the diverse and site-specific nature of nonpoint source pollution, States are given primary responsibility. State and local governments develop nonpoint source control plans that can include regulatory measures but mostly emphasize voluntary actions. The ***Nonpoint Source Program***, established by Section 319, authorizes grants to States for developing and promoting nonpoint source management plans. States have established a number of watershed projects under this program that involve many local, state, and Federal stakeholders. EPA's role is to provide program guidance, technical support, and limited funding. Through 1995, EPA has provided over $274 million in grants to such projects, of which $107 million was for agriculture.

The ***Coastal Zone Management Act Reauthorization Amendments*** (CZARA) added important nonpoint source (NPS) water pollution requirements to the Coastal Zone Management Act. This is the first federally mandated program requiring specific measures to deal with agricultural nonpoint sources. CZARA requires that each State with an approved coastal zone management program submit to EPA and to the National Oceanic and Atmospheric Administration a program to "implement management measures for nonpoint source pollution to restore and protect coastal waters." A list of economically achievable measures for controlling agricultural NPS pollution is part of each State's management plan. States can first try voluntary incentive mechanisms, but must be able to enforce management measures if voluntary approaches fail. Implementation of plans is not required until 1999. In general, annual costs of CZARA management measures are estimated to be less than $5,000 per farm for most farm sizes. Exceptions are grazing management measures for larger farms in the West, and manure management measures on larger dairy farms (Heimlich and Barnard, 1995).

The Safe Drinking Water Act (SDWA) requires the EPA to set standards for drinking-water quality and requirements for water treatment by public water systems. The SDWA authorized the ***Wellhead Protection Program*** in 1986 to protect supplies of ground water used as public drinking water from contamination by chemicals and other hazards, including pesticides, nutrients, and other agricultural chemicals. The program is based on the concept that land-use controls and other preventive measures can

protect ground water. Currently, 43 States have an EPA-approved wellhead protection program.

The ***Comprehensive State Ground Water Protection Program (CSGWPP),*** established in 1991, coordinates all Federal, State, tribal, and local programs that address groundwater quality. States have the primary role in designing and implementing CSGWPP's in accordance with local needs and conditions. EPA has approved programs in 5 States, and plans from an additional 13 States are under review.

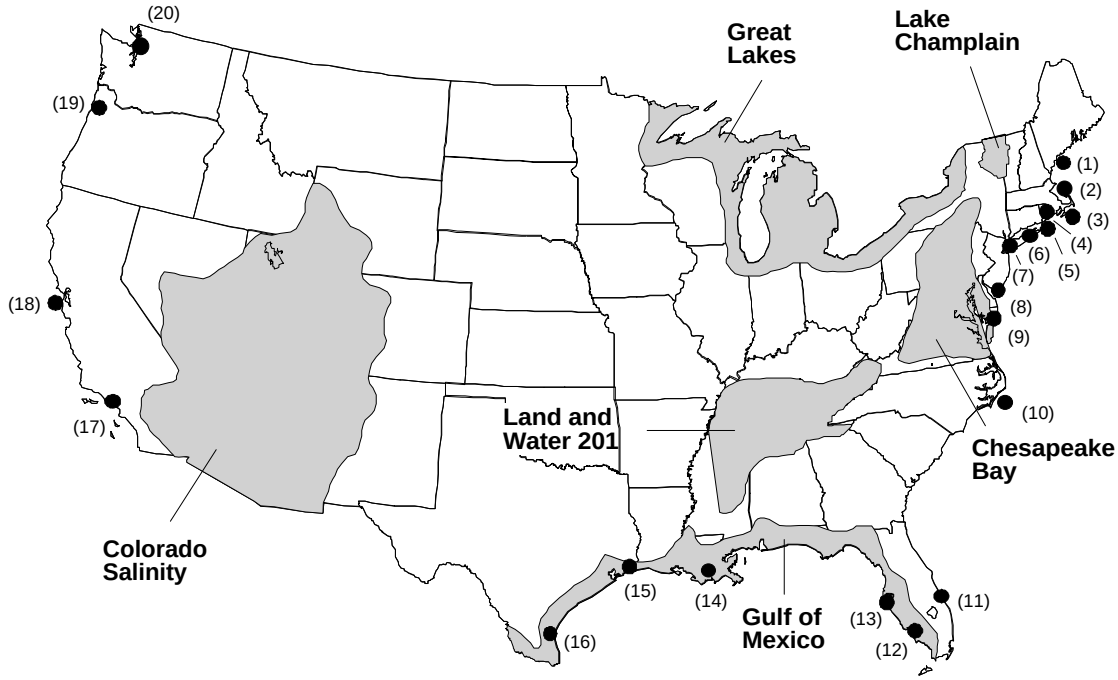
EPA also administers some multi-agency regional programs targeted at particular water bodies (fig. 6.2.1). EPA's ***National Estuary Program*** helps States to develop and carry out basin-side, comprehensive programs to conserve and manage their estuary resources (fig. 6.2.1). The ***Clean Lakes Program*** authorizes EPA grants to States for lake classification surveys, diagnostic/feasibility studies, and for projects to restore and protect lakes.

State Programs

Some 44 States have passed laws or instituted programs that either protect water quality directly, or indirectly by affecting some aspect of agricultural production that is associated with the generation of agricultural nonpoint source pollution (table 6.2.1). Some of these laws are in response to Federal laws such as the Clean Water Act. Others are in response to chronic problems such as nitrates or pesticides in ground water. States use a variety of approaches for addressing water quality problems: controls on inputs or practices, controls on land use, economic incentives, and education programs.

Input controls are primarily directed at pesticides and nutrients. Most States require certification of pesticide applicators. Some States restrict where particular chemicals can be used, usually in response to observed groundwater problems. Nutrient management plans are required in 16 States, usually in areas affected by groundwater contamination.

Figure 6.2.1--Estuary and regional programs for water quality, 1996



● Estuaries of national significance: (1) Casco Bay, (2) Massachusetts Bay, (3) Buzzards Bay, (4) Narragansett Bay, (5) Peconic Bay, (6) Long Island Sound, (7) New York-New Jersey Harbor, (8) Delaware Bay, (9) Delaware Inland Bays, (10) Albemarle-Pamlico Sound, (11) Indian River Lagoon, (12) Sarasota Bay, (13) Tampa Bay, (14) Barrataria-Terrebonne Estuary, (15) Galveston Bay, (16) Corpus Christi Bay, (17) Santa Monica Bay, (18) San Francisco Bay, (19) Tillamook Bay, (20) Puget Sound, (21) San Juan Bay (Puerto Rico, not pictured).

Technical assistance provided by the Natural Resources Conservation Service.
Source: USDA, ERS, based on Natural Resources Conservation Service information.

Table 6.2.1—Summary of State water quality mechanisms, 1996[1]

State	Nutrient plan requirement	Restrictions on			Cost-share	Farm*A*Syst[2]
		Pesticide	Chemigation	Sediment		
Alabama					X	
Arizona	X	X			X	
Arkansas						X
California		X				
Colorado	X		X			
Connecticut	X			X	X	
Delaware				X	X	
Florida	X	X	X	X	X	X
Georgia			X		X	
Hawaii			X	X		
Idaho	X		X	X	X	
Illinois			X	X	X	X
Indiana					X	
Iowa		X	X	X	X	
Kansas			X		X	X
Kentucky	X					X
Maine				X		
Maryland	X	X		X	X	
Michigan	X			X		X
Minnesota	X		X	X	X	X
Mississippi					X	
Missouri					X	X
Montana				X	X	X
Nebraska	X		X		X	
Nevada			X			
New Hampshire			X			
New Jersey		X			X	
New Mexico						X
New York			X			
North Carolina			X		X	
North Dakota			X			X
Ohio				X	X	
Oklahoma	X			X	X	
Oregon						X
Pennsylvania	X			X	X	
Rhode Island						
South Carolina			X		X	
South Dakota			X	X	X	X
Utah					X	
Vermont	X					
Virginia	X	X			X	X
Washington			X			
Wisconsin	X	X	X	X	X	X
Wyoming	X			X		

[1] Mechanisms may apply only under certain conditions or in certain localities.[2] Farmstead Assessment System helps farmers, ranchers, and rural residents to evaluate pollution risks on their properties and to identify remedial actions.
Sources: USDA, ERS, based on Ribaudo and Woo, 1991; Gadsby, 1996; Jackson, 1996.

Chemigation is banned or tightly controlled in 19 States.

Practices for controlling soil erosion to address water quality problems are required in 18 States. In most, best management practices (BMP's) are required if a complaint is filed by a citizen or government agency. Some States require erosion control plans on cropland, but actual implementation of BMP's is contingent on the availability of cost-share funds.

As animal operations become larger, more States are looking at ways of protecting environmental quality from animal waste. Large confined animal operations can present major water quality problems at the local level. Large operations (greater than 1,000 animal units) are subject to the NPDES point-source permits of the Clean Water Act. However, these permits address only storage of manure on the site, and not disposal. Pennsylvania is the first State to pass a comprehensive nutrient management law aimed at concentrated animal operations. Animal operations with over two animal units per acre of land available for spreading must have a farmlevel nutrient management plan that demonstrates that waste is being safely collected and disposed. An animal unit is defined as 1,000 pounds of live weight.

Land-use laws that affect agriculture are being used by municipalities, counties, and other local governments. Land-use controls include zoning, land acquisition, and easements targeted to areas deemed critical for protecting water resources. Zoning ordinances are used in many areas, especially around the rural-urban fringe, to ban confined animal operations.

Economic incentives for water quality primarily take the form of cost-sharing; 27 States have cost-share programs for soil conservation and other practices. Tax credits are used to a much lesser degree. (Many States have fertilizer taxes, which can be a negative incentive, but these are for revenue generation rather than environmental protection.)

State water quality laws are often driven by court decisions brought about by citizen suit. For example, in hearing a citizen suit brought against a dairy operation in New York, the Second Circuit Court of Appeals made a ruling that could expand the point-source designation of concentrated animal feeding operations to cover all associated lands used for manure disposal (Martin, 1996).

A national voluntary program that originated from local needs is Farm*A*Syst, developed in Wisconsin by state Extension staff, with support from USDA and EPA, to protect farm water supplies. Farm*A*Syst helps farmers, ranchers, and rural residents identify and reduce agricultural and household sources of pollution. Using assessment worksheets, farmers and other rural landowners evaluate structures and management practices for their pollution risks. Once aware of potential problems, landowners can take appropriate action. All 50 States have expressed some interest in the program, and it is being implemented in 15. Farm*A*Syst is also being integrated into USDA and EPA water quality programs.

USDA Programs

In FY 1995, the USDA spent an estimated $3.5 billion on voluntary resource conservation and other environmental programs and activities, many of which addressed water quality (see chapter 6.1, *Conservation and Environmental Programs Overview*). USDA uses six broad approaches to achieve conservation and environmental goals, including: (1) technical assistance and education, (2) financial assistance (cost-sharing and incentive payments), (3) public works projects, (4) rental and easement programs, (5) data and research programs, and (6) compliance programs "linked" to commodity and other USDA program benefits. Typically one or two of these approaches are evident in the many programs and activities USDA has used to address water quality and pollution prevention. For example, the Agricultural Conservation Program (ACP) and the Colorado Salinity Control Program (CRSCP) provided technical assistance (by the Natural Resources Conservation Service) and cost-sharing (by the Farm Service Agency) for installation of BMP's. Rental and easement programs (primarily land retirement programs) pay farmers to take land out of production and place it in conservation uses and provide technical assistance to help manage retired land. Technical assistance plays a crucial role in programs that are linked to commodity programs, such as Conservation Compliance.

USDA research programs complement the other five approaches. Activities include: (1) research on new and alternative crops and agricultural technologies to reduce agriculture's harmful impacts on water resources; (2) research that estimates the economic impacts of policies, programs, and technologies designed to improve water quality and prevent pollution; and (3) environmental and conservation data collection. USDA also administers competitive grants and coordinates conservation and water quality research conducted by State Agricultural Experiment Stations and land grant universities.

The 1996 Federal Agriculture Improvement and Reform Act (1996 Farm Act) continues the same approaches but, beginning in 1997, consolidates some

Addressing Water Quality in the 1996 Farm Act

The Federal Agriculture Improvement and Reform Act of 1996 (the 1996 Farm Act) made significant changes in how USDA provides support to landowners for adopting conservation practices. The Act combined the functions of the Agricultural Conservation Program (ACP), Great Plains Conservation Program (GPCP), Water Quality Incentives Projects, and Colorado River Salinity Control Program into a single program, the ***Environmental Quality Incentives Program (EQIP)***. EQIP is to provide financial assistance to farmers and ranchers such that environmental benefits per dollar expended are maximized. Whereas previous USDA conservation assistance was often available on a first-come, first-serve basis to farmers and ranchers, EQIP will be targeted to priority conservation areas and identified problems outside of priority areas. Assistance will be provided only to those farmers and ranchers facing the most serious threats to soil, water, and related natural resources, including grazing lands, wetlands, and wildlife habitat. Contracts will be for 5 to 10 years, giving farmers the chance to learn to use new practices successfully. Cost-sharing may pay up to 75 percent of the costs of installing approved practices. The annual payment limit is $10,000, with a maximum of $50,000 per contract. Half of the appropriated funding for the program is targeted at practices or systems relating to livestock production. However, owners of large confined livestock operations (generally over 1,000 animal units, but States may request another definition based on environmental circumstances) are not eligible for cost-share asistance for installing animal waste storage or treatment facilities.

The ***Conservation Farm Option*** of the 1996 Farm Act is a pilot program that will provide producers of wheat, feed grains, cotton, and rice who have acres enrolled in production flexibility contracts the opportunity to receive one consolidated payment for implementing a 10-year conservation plan in lieu of separate payments from CRP, WRP, and EQIP (see chapter 6.1, *Conservation and Environmental Programs Overview*).

Table 6.2.2—Summary of ACP expenditures and acres treated for water quality purposes, FY 1991-95

Item	1991	1992	1993	1994	1995
Expenditures, by category:			*$ million*		
Integrated crop management	0.8	1.3	1.4	1.7	1.8
Water Quality Incentive Project	NA	0.3	1.9	4.3	6.5
Animal waste structures	15.9	18.2	19.0	21.9	16.4
Other	13.8	16.9	15.7	16.4	11.9
Total	30.5	36.7	38.0	44.2	36.6
Percent of expenditures, by purpose:			*Percent of water quality expenditures*		
Sediment	15.9	16.0	14.9	13.4	13.2
Animal waste	60.4	56.0	55.1	56.3	56.4
Nutrients	15.7	15.7	15.8	18.4	17.6
Pesticides	1.9	3.1	3.0	3.9	4.9
Salinity	2.6	2.4	2.6	2.4	3.1
Other	3.5	6.8	8.6	5.6	4.7
Total	100.0	100.0	100.0	100.0	100.0
Acres treated, by major practice:			*1,000 acres treated*		
Water quality incentive practice	NA	47.6	250.9	551.7	822.1
Integrated crop management	137.7	221.0	237.1	345.7	284.7
Cropland protective cover	225.8	257.1	189.2	163.9	9.2
Grazing land protection	46.2	88.5	123.0	89.2	73.6
No-till	57.6	74.9	69.8	92.9	54.2
Permanent vegetative cover	60.3	64.2	67.7	85.1	43.8
Irrigation water conservation	66.1	76.4	59.6	105.0	44.1

NA - WQIP not in effect
Source: USDA, ERS, based on Farm Service Agency data.

programs and increases the targeting of conservation and water quality efforts to priority problem areas (see box, "Addressing Water Quality in the 1996 Farm Act" for more detail). USDA programs that addressed water quality in 1995-96 are described below.

Agricultural Conservation Program (ACP)

The ACP provided financial assistance to agricultural producers to help solve a wide range of agricultural conservation and environmental problems, including water quality. Program activities included prevention of soil loss, water conservation, improvement of water quality, conservation of forest and wildlife resources, and pollution abatement. With several important exceptions, ACP funds were not targeted to specific geographic areas. About 100 technical practices were eligible for ACP cost-share funds. Up to 75 percent of the total cost of implementing the practice could be payed by ACP, with a maximum of $3,500 per recipient per year. ACP also reimbursed the Natural Resources Conservation Service (NRCS) for technical assistance in planning and implementing technical practices.

ACP was traditionally used to address soil erosion and water conservation issues. In recent years, as concern over water quality grew, more ACP resources were devoted to water quality practices. Cost-share expenditures on practices whose primary purpose was water quality rose from $13.4 million in 1988 to $44.2 million in 1994 (table 6.2.2), or from 7.1 percent of ACP expenditures to 23.1 percent (USDA, CFSA, 1995a). By 1994, almost all of USDA's water quality cost-share funds came from ACP.

Evidence suggests that profitability is the primary factor for farmers adopting new practices (Logan, 1990; Camboni and Napier, 1994; Magleby and others, 1989). Practices most frequently cost-shared

by ACP included conservation tillage, irrigation water management, and nutrient management. All have been shown to increase net returns in many parts of the country.

Conservation Technical Assistance (CTA)

Conservation Technical Assistance provides technical assistance to farmers for soil and water conservation and water quality practices, and is administered by NRCS. CTA provides technical assistance to farmers adopting practices cost-shared under ACP, and to other producers who ask for assistance in adopting approved NRCS practices. In 1995, the CTA program spent $7.6 million on water quality-related assistance, apart from those activities directly related to the Water Quality Program (see below). This includes assistance provided to programs run by agencies other than USDA (see below).

Water Quality Incentive Projects (WQIP)

The Water Quality Incentives Projects was created by the 1990 Food, Agriculture, Conservation and Trade Act, and was administered as an ACP practice. The goal of WQIP was to reduce agricultural pollutants through sound farm management practices that restore or enhance water resources compromised by agricultural nonpoint source pollution. Areas eligible for WQIP included: watersheds identified by States as being impaired by nonpoint source pollution under Section 319 of the Clean Water Act; areas identified by State agencies for environmental protection and so designated by the Governor; and areas where sinkholes conveyed runoff directly into ground water. A total of 242 projects were started during FY 1993-95.

Eligible producers entered into 3- to 5-year agreements with USDA to implement approved management practices on their farms, as part of an overall water quality plan, in return for an incentive payment. The WQIP supported 39 different practices for protecting water quality (table 6.2.3). Consistent with practices funded under ACP, these were the conservation practices most likely to increase net farm returns.

Integrated Crop Management (ICM)

Integrated crop management was instituted in 1990 on a trial basis as part of the ACP. ICM promoted the efficient use of pesticides and fertilizers in an environmentally sound and economical manner. ICM provided 75-percent cost sharing, not exceeding $7 per acre for most field crops or $14 per acre for horticultural and specialty crops. Cost sharing was made available for up to 3 years for practices including pest scouting services, soil testing, or the rental of specialized machinery. In 1992, ICM was included as an eligible practice under WQIP, where it received a flat incentive payment of up to $10 per acre for field crops and $20 per acre for specialty crops. From 1990 to 1993, ICM was implemented on about 830,000 acres.

Table 6.2.3—Major practices installed under WQIP, FY 1992-95

Practice	Acres
	1,000 acres
Conservation Cropping Sequence	181.1
Conservation Tillage	140.4
Crop Residue Use	78.6
Integrated Crop Management	305.6
Irrigation Water Management	152.4
Nutrient Management	349.5
Pasture and Hayland Management	123.0
Pest Management	273.7
Waste Utilization	124.2

Note - one acre treated in two different years with the same practice is counted as two acres treated.
Source: USDA, ERS, based on FSA program data.

An analysis of the first year of ICM on four crops grown in four States indicated limited success (Osborn and others, 1994): nitrogen fertilizer reductions of 16 to 32 percent per acre on corn, wheat, and cotton were found. Use of other fertilizers (phosphorus and potassium) were largely unaffected. ICM's effect on herbicide use varied by crop. ICM resulted in a net increase in total herbicide use on corn, no significant effect on soybeans, and a decrease on wheat.

Health and environmental risks from pesticide applications were apparently reduced by ICM in some instances, while in others they were increased. An index that accounts for risks to farmworkers, consumers, and the environment from pesticide applications indicated that ICM generally reduced risks in its first year (Dicks and others, 1991). However, ICM impacts were not uniform. About 40 percent of the sampled farms demonstrated a net increase in the index or a negative environmental impact, often due to a change in the mix of chemicals used. Producers switched to chemicals that can be applied at lower rates but leach more easily or are

more toxic. Simply reducing chemical applications may not provide adequate environmental protection from pesticides. The toxicity or leaching characteristics of new chemicals must be considered, as well as changes in application strategies.

Colorado River Salinity Control Program (CRSCP)

The Colorado River Salinity Control Program was started in 1984 to identify salt source areas in the Basin; assist landowners and operators in installing practices to reduce salinity in the Colorado River; carry out research, education, and demonstration activities; and monitor and evaluate the activities being performed. The Colorado River is the primary source of water for over 18 million people in Arizona, California, Colorado, Nevada, New Mexico, Utah, Wyoming, and Mexico. Water is used for irrigated agriculture, generating hydroelectric power, and municipal and industrial purposes. CRSCP was jointly administered by USDA and the U.S. Department of the Interior. The Bureau of Reclamation constructed salinity control structures for water distribution systems, and USDA provided technical and financial assistance to help irrigators implement improved irrigation systems.

The improved irrigation systems were designed to increase irrigation efficiency and to reduce the movement of salt into the ground water. Efforts included installing more efficient sprinklers, installing pipe, and lining delivery canals. Landowners who wish to participate, once their application was approved, submitted to a contract of 3 to 10 years. Besides agreeing to build and install the salinity control project, the landowner agreed to operate and maintain the project for as long as 25 years. The cost-shares mitigated the upfront costs of more efficient systems, which might otherwise have discouraged landowners.

Through 1994, 150,000 acres had been treated, out of 360,000 acres originally identified as needing treatment (U.S. GAO, 1995b). The program has conserved about 300,000 acre-feet of water (USDA, CFSA, 1995b). Salt loadings are down 191,223 tons per year (U.S. GAO, 1995b), 38 percent of the total reduction believed possible. The cost-effectiveness of the project ranges from $38 to $70 per ton of salt removed (U.S. GAO, 1995). Salt levels at the three monitoring stations have remained below the limits instituted under the Clean Water Act, thus satisfying the program's goal.

USDA's Water Quality Program

In 1990, USDA made a commitment to protect the Nation's waters from contamination by agricultural chemicals and waste products by establishing the Water Quality Program (WQP). The WQP was in response to a Presidential initiative in the 1990 budget for enhancing water quality. The initiative integrates the combined expertise of four Federal departments (USDA, EPA, Interior, and Commerce) to promote the use of environmentally and economically sound farm production practices, and to develop improved chemical and biological pest controls. The WQP in 1996 was in its seventh year, with annual expenditures ranging from $83 to $116 million (table 6.2.4).

The WQP strives to (1) determine the precise nature of the relationship between agricultural activities and water quality; and (2) develop, and induce the adoption of, technically and economically effective agrichemical management and agricultural production strategies that protect surface- and groundwater quality (USDA, 1993). The WQP contains three major components: (1) research and development; (2) education, technical, and financial assistance; and (3) database development and evaluation. The scale of the program, and the integration of research and database development with the traditional education, technical, and financial assistance projects, makes this program unique to USDA. Originally intended as 5-year program, USDA funding for limited program activities is projected beyond 1999 (USDA, ERS, 1994).

WQP research has improved our understanding of the relationship between water quality and production practices in the Midwest. In particular, the Management System Evaluation Area (MSEA) efforts have resulted in a number of improvements in nitrogen management, herbicide management, crop management, and irrigation water management. The MSEA findings are improving USDA's ability to provide farmers with information on practices that are sound economically, agronomically, and environmentally.

The Hydrologic Unit Area (HUA) and Demonstration Projects (DP), which target education, technical, and financial assistance in areas with known agricultural pollution problems, have shown progress in:

- *Nitrogen management*. Through 1993, nitrogen management practices (including cover and green manure crops) have been implemented on 1 million acres, about 46 percent of the 5-year goal for the 90

Table 6.2.4—Status of Water Quality Program (WQP) and associated activities, FY 1991-95

Activity	Unit	1991	1992	1993	1994	1995
Educational, technical, and financial assistance activities:						
Demonstration Projects:						
Number of active projects	Number	16	16	16	16	15
Demonstration farms	Number	135	135	NA	NA	NA
Total USDA funding[1]	Mil. dol.	8.5	8.5	7.7	5.8	5.7
Ratio education/technical/financial	Percent	25/54/21	25/54/21	29/60/11	36/64/0	37/63/0
Hydrologic Unit Area projects:						
Number of active projects	Number	74	74	74	74	68
Total USDA funding	Mil. dol.	31.5	28.1	17.3	15.0	14.7
Ratio education/technical/financial	Percent	12/50/38	14/43/43	20/60/11	27/73/0	28/72/0
Water Quality Special Projects:						
Number of annual projects	Number	35	35	2	0	0
Total USDA funding	Mil. dol.	9.1	9.1	1.1	0	0
Ratio education/technical/financial	Percent	0/5/95	0/5/95	0/5/95	NA	NA
Water Quality Incentive Projects:						
Number of projects started	Number	0	0[2]	106	71	65
Project acres	Mil. acre	0	0[2]	4.8	3.8	8.4
Total USDA funding	Mil. dol.	0	6.8	15.0	15.0	15.0
Regional activities:						
Regional continuing projects	Number	5	5	6	6	6
Estuaries of National Significance	Number	17	21	21	21	21
Total USDA funding	Mil. dol.	22.7	23.1	22.1	25.2	15.1
Ratio education/technical/financial	Percent	0/61/39	0/58/42	0/63/37	0/67/33	0/96/4
Improved program support:						
CSREES	Mil. dol.	3.9	5.0	5.0	4.6	4.6
NRCS	Mil. dol.	7.5	7.6	7.6	8.1	7.9
ERS	Mil. dol.	0.5	0.5	0.5	0.4	0.4
Research and development activities:						
Management System Evaluation Areas	Number	5	5	5	5	6
ARS expenditures	Mil. dol.	12.9	15.3	15.3	15.3	15.3
CSREES research grants	Mil. dol.	9.0	9.0	9.0	4.2	2.8
ERS collaboration	Mil. dol.	0.5	0.5	0.5	0.4	0.4
Database development and evaluation activities:						
ERS for agricultural chemical database	Mil. dol.	1.9	1.9	2.3	1.0	1.0
CSREES for chemical database support	Mil. dol.	0.3	0.3	0.3	0.4	0.4
National Agricultural Library for information center	Mil. dol.	0.3	0.3	0.3	0.3	0.3
Total USDA funding for WQP and associated activities	Mil. dol.	108.6	116.0	104.0	95.7	83.6

[1] Excludes funds to ERS, which are included under improved program support.
[2] Funds distributed to 49 existing HUA's.
NA = Not available.
Source: USDA, ERS, based on Office of Budget and Program Analysis data.

DP and HUA projects (USDA, NRCS, 1995). Annual nitrogen reductions averaged almost 42 pounds per acre on land receiving treatments.

- *Phosphorus management*. Phosphorus management practices, including those for managing field applications of animal waste, had been implemented on about 850,000 acres by 1993, which is nearly 100 percent of the 5-year goal (USDA, NRCS, 1995). Annual phosphorus reductions averaged about 40 pounds per acre. Predominant phosphorus management practices include nutrient management, use of cover and green manure crops, and conservation tillage.

- *Pesticide management*. Through 1993, 501,000 acres had been treated with pesticide management practices (USDA, NRCS, 1995), nearly 43 percent of the 5-year goal of the 90 projects. Practices include scouting, improved application/timing, mechanical control of pests, use of host crops and predators for pest control, and crop rotations. Pesticide reductions averaged nearly 0.6 pound per acre active ingredient (AI) in 1993. The significance of the chemical reductions in many projects is limited by inadequate knowledge of pre-project application rates (USDA, SCS, 1993).

- *Erosion and sediment control*. Erosion and sediment control practices have been installed on over 1 million acres (USDA, NRCS, 1995). Over 50 different conservation practices are being used to abate erosion and sediment delivery in the project areas, some of which are innovative and not included in the SCS technical manual. Practices include rotations, crop residue use, conservation tillage, cover and green manure crops, and pasture and hayland planting.

- *Water management*. In 1993, the HUA's and DP's implemented irrigation water management practices on 119,000 acres, reducing average annual application of irrigation water by 11 inches per acre (USDA, NRCS, 1995). Irrigation application efficiency on treated fields increased by 18 percent.

The practices successfully promoted are those known to increase net returns, consistent with ACP and WQIP. Targeted financial assistance ended as of 1993. An assessment of HUA's found that acreage goals for a number of practices have not yet been achieved (USDA, NRCS, 1996). Previous experience with USDA voluntary programs has indicated that financial assistance is often critical in getting farmers to try new practices; education and technical assistance alone are not enough (Magleby and others, 1989).

Conservation Compliance

Conservation Compliance provisions were enacted in the Food Security Act of 1985 to reduce soil erosion. Producers who farmed highly erodible land (HEL) were required to implement a soil conservation plan, including prescribed or alternative technical practices, to remain eligible for programs such as price support, loan rate, crop insurance, disaster relief, CRP, and FmHA loans (see chapter 6.4, *Conservation Compliance*). NRCS provides technical assistance for planning and implementing the practices, and some-cost share assistance may be available through ACP or other programs. The magnitude of erosion reductions will result in sizable water quality benefits. ERS has estimated that the average annual water quality benefits from Conservation Compliance are about $13.80 per acre (USDA, ERS, 1994). Conservation compliance results in a large social dividend, primarily due to offsite benefits. An evaluation using 1994 data on HEL fields indicates that the national benefit/cost ratio for Compliance is greater than 2, based on reported changes in tillage practices and expected changes in water quality. In other words, the monetary benefits associated with water quality, air quality, and productivity outweigh the costs to government and producers (USDA, ERS, 1994).

Conservation Reserve Program

The Conservation Reserve Program was established in Title XII of the Food Security Act of 1985 as a voluntary long-term cropland retirement program. USDA provides CRP participants with an annual per-acre rent and half the cost of establishing a permanent land cover (usually grass or trees) in exchange for retiring highly erodible or other environmentally sensitive cropland for 10-15 years. CRP enrollment reached 36.4 million acres in 1993. At its peak, the CRP reduced soil erosion by nearly 700 million tons per year, or 19 tons per acre. This was a 22-percent reduction in U.S. cropland erosion (USDA, ERS, 1994). (For more on the CRP, see chapter 6.3).

Erosion from cropland has been estimated to cause between $2 and $8 billion in damages each year (Ribaudo, 1989; Clark, Haverkamp, and Chapman, 1985). These damages include reduced recreation opportunities, increased water treatment costs, sedimentation of reservoirs, increased dredging of navigation channels, and silting up of drainage and irrigation channels. The erosion reductions estimated

for the 36.4 million acres enrolled in the CRP are estimated to generate about $437 million annually in benefits to water users. These estimates do not include the water quality benefits from reduced use of nutrients and pesticides on the land removed from production.

As a general approach for improving water quality, retiring cropland can be very expensive. Even though the water quality benefits are "guaranteed" as long as the land is retired, land retirement probably cannot be economically justified on the basis of water quality benefits alone. However, there are areas where the benefits of retiring cropland outweigh the costs. These could include riparian areas, wellhead recharge areas, and drainage areas around particularly valuable reservoirs.

Wetland Reserve Program

The Wetland Reserve Program was authorized in 1990 as part of the Food, Agriculture, Conservation and Trade Act of 1990. Administered by NRCS, the WRP provides easement payments and restoration cost-shares to landowners who permanently return prior converted or farmed wetlands to wetland condition. Easement payments cannot exceed the fair market value of the land, less the value of permitted uses, such as hunting or fishing leases or managed timber harvest. An enrollment goal of 975,000 acres by the year 2000 was set.

The Wetland Reserve Program is primarily a habitat protection program, but retiring cropland and converting back to wetlands also has water quality benefits. Some benefits arise from reduced chemical use on former cropland, but the greatest potential benefits come from the ability of the wetland to filter sediment and agricultural chemicals from runoff and to stabilize stream banks. The value of wetlands and other riparian vegetation as water purification systems has been well documented (Cooper and others, 1987; Cooper and Gilliam, 1987). Artificial wetlands are currently used to treat runoff from animal facilities.

The degree to which created wetlands will improve water quality has not been estimated. One study put the water quality benefits of converting cropland to streamside vegetative buffers at about $95 per acre (Ogg and others, 1989). Creation of a wetland as opposed to a filter strip would likely generate greater water quality benefits.

The Wetland Reserve Program is not targeted on a watershed basis. Water quality benefits would be enhanced by targeting enrollment to watersheds in greatest need of protection from agricultural runoff. Research in Illinois indicates that adequate flood control and water quality improvements in a watershed can be achieved with as little as 2 to 5 percent of the watershed acreage in strategically located wetlands (Stevens, 1995).

USDA Support of Non-USDA Programs

USDA is supporting several water quality projects sponsored under non-USDA programs (see fig. 6.2.1). USDA provides accelerated technical and financial assistance to farmers in the upland areas of the 21 National Estuary Program projects through CTA and ACP. USDA provides the same support to several multi-agency regional programs to manage and protect water resources. These include the ***Chesapeake Bay Program***, ***Great Lakes National Program***, ***Gulf of Mexico Program***, ***Lake Champlain Program***, *and* ***Land and Water 201 Program***. USDA support for the Estuary Program and regional programs totaled $15.1 million in 1995.

USDA is assisting EPA's Clean Lakes Program by targeting some of the Small Watershed Program flood control and land treatment projects to Clean Lakes Program projects. USDA is providing program support in many of EPA's Section 319 watershed projects. Some of the HUA and WQIP projects have been targeted to watersheds identified under Section 319. Technical assistance from NRCS for Section 319 projects totaled $300,000 in 1995.

Successful Water Quality Projects

Besides the programs currently being administered, USDA has gained experience from previous efforts targeting agricultural nonpoint source reductions (see box, "Past USDA Water Quality Efforts"). Improvements in water quality from nonpoint source pollution reductions often take years to detect because of the store of pollutants already in the water resources, pollutants already in the soil profile, and other factors such as weather variations and changes in crops grown. While improvements to water quality from most current USDA programs are not yet apparent, the sizable reductions in pollutants entering water resources because of these programs suggest that water quality improvements will follow.

Several completed watershed projects have documented improvements in water quality from activities undertaken in the watershed. Animal waste management greatly improved water quality in Rural Clean Water Program (RCWP) projects in Snake Creek, Utah, and the Tillamook Bay, Oregon (U.S. EPA, 1990). Implementation of BMP's reduced

Past USDA Water Quality Targeted Efforts

Model Implementation Program (MIP) 1978-82. The Model Implementation Program was an experimental program designed to demonstrate and study a concerted attempt by USDA and EPA to address agricultural nonpoint source water quality problems by using existing program authorities. The MIP consisted of seven projects. USDA offered education, technical, and financial assistance to help farmers adopt best management practices. The project resulted in a number of recommendations for improving future agricultural water quality programs (National Water Quality Evaluation Project, 1983).

Rural Clean Water Program (RCWP) 1980-86. RCWP was initiated in 1980 as an experimental effort to address agricultural nonpoint source pollution in watersheds across the country. Twenty-one projects were funded, representing a wide range of pollution problems and impaired water uses. Farmer participants received technical and financial assistance to implement best management practices to reduce polluted runoff or infiltration. Monitoring and evaluation were conducted to document water quality improvement and economic benefits and costs. Funding for practices ended in 1986, but monitoring continued until 1995. Results of the program were mixed. Some projects documented water quality improvements. Economic benefits from actual or expected water quality improvements were estimated to exceed costs in about half the projects studied (Magleby and others, 1989).

Water Quality Special Projects (WQSP) 1991-92. Water Quality Special Projects extended cost-share assistance to farmers and ranchers for installing approved water quality practices in small watersheds with identified agricultural nonpoint-source problems. Funding was through ACP. Limited technical assistance was available from the Soil Conservation Service. WQSP's were annual projects, although landowners could enter into multiyear agreements. No new projects were funded after 1992.

phosphorus and fecal coliform from animal waste by substantial amounts. Keeping animals out of streams in the Taylor Creek-Nubbin Slough Basin, Florida RCWP project cut phosphorus concentrations in some Lake Okeechobee tributaries by 50 percent. Irrigation water management and other BMP's in the Rock Creek, Idaho RCWP project reduced suspended sediment concentrations in the watershed. These projects were able to document water quality improvements only after many years of implementation activity and extensive monitoring.

In the Ketch Brook Watershed Section 319 project in Connecticut, agricultural and other BMP's reduced sediment in roadside ditches and a wetland (U.S. EPA 1994). Nolichucky River Watershed in Tennessee had a significant pollution problem from animal wastes. One year after animal waste BMP's were installed on the majority of animal operations as part of a Section 319 project, statistically significant improvements in benthic habitat in two subwatersheds were observed (U.S. EPA, 1994). Battle Branch Watershed in Oklahoma, a Section 319 project, suffered elevated nutrient loadings from poultry and dairy operations. Structural and nonstructural BMP's for managing nutrients reduced nitrate levels during runoff as much as 72 percent, and total phosphorus levels as much as 35 percent (U.S. EPA, 1994).

West Lake Reservoir, a Section 319 project in Iowa, was being hurt by sediment and atrazine. Half the watershed for the reservoir was in corn-soybean rotation. Sediment was rapidly reducing reservoir capacity, damaging filtration systems, and increasing operation and maintenance costs. Atrazine levels were above the maximum contaminant levels specified under the Safe Drinking Water Act. As part of the project, no-till and ICM were promoted to producers in the watershed. Atrazine use in the watershed was cut in half and there were significant reductions in soil erosion (U.S. EPA, 1994). As a result of these reductions, atrazine concentrations in the reservoir have dropped below the maximum contaminant level. The concentrations of another pesticide, cyanazine, have also decreased.

Lessons Learned From Water Quality Programs

Experience with past and present water quality programs suggests several recommendations for the success of voluntary water quality programs:

- ***Voluntary programs are likely to be most successful in areas where farmers recognize that agriculture contributes to severe local pollution problems such as groundwater impairment***. A survey of producers in some Water Quality Program projects indicated that farmers believe they have a responsibility to protect water quality if they are

causing a problem (Nowak and O'Keefe, 1995). The lack of such a belief has been attributed to slow progress in the Darby Creek HUA project in Ohio (Camboni and Napier, 1994). On the other hand, the immediate threat to West Lake Reservoir in Iowa apparently spurred quick action by the farm community (U.S. EPA, 1994).

One of the roles of education is to increase problem awareness. Educating producers about the potential impacts of poor water quality on personal health, the health of neighbors, and the health of the environment may speed up the adoption process. Farm*A*Syst has been successful in getting farmers to reduce risks to water supplies by raising their awareness of activities around the farm that pose risks to them and their families. Assessments of the program in Arkansas, Minnesota, and Wisconsin found that those who participated in the risk-assessment activities were more likely to implement groundwater protection practices (Jackson, Knox, and Nevers, 1995).

- ***Voluntary programs are likely to be successful when the alternative practices recommended generate higher returns.*** The long-term success of voluntary programs depends on farmers continuing to use new practices after assistance ends. Continued use is more likely if practices are profitable. The practices being adopted under ACP and the Water Quality Program are those known to increase net returns, namely conservation tillage, nutrient management, and irrigation water management. Some practices being promoted in the Water Quality Program Demonstration Projects (Rockwell and others, 1991) were not adopted by farmers because they were not profitable. Research can help identify those practices that protect water quality and are also profitable.

- ***Cost-effectiveness is enhanced when program activities are targeted to watersheds—and to critical areas within watersheds—where agriculture is the primary source of a water quality impairment.*** Watersheds with identifiable problems may differ greatly in the water quality improvement that can be achieved and in the economic and social benefits and costs of that achievement. The success of some RCWP projects was limited because agriculture turned out not to be the primary source of water quality impairment (Magleby and others, 1989). In addition, identifying critical areas for priority treatment within watersheds, as well as the set of management practices that are best suited for addressing the particular problem, increases the cost-effectiveness of assistance.

- ***Flexible cost-share programs for practice adoption are more efficient than those with fixed rates and limited lists of supported practices.*** Improvements in current cost-share programs can be made by increasing the maximum amount of incentive payment and quickly approving the financial support of innovative practices. A study by the Sustainable Agriculture Coalition found that per-acre incentive payments for WQIP were not enough to interest some producers to implement management changes identified as necessary for meeting individual project goals (Higgins, 1995). The study concluded that the payments for the following practices were too low in some regions: Waste Management System, Conservation Cover, Conservation Tillage, Critical Area Planting, Filter Strip, Pasture and Hayland Management, Pasture and Hayland Planting, Planned Grazing System, Stripcropping, Nutrient Management, Pest Management, and Record Keeping (Higgins, 1995).

  These conclusions are supported by ERS research findings. Feather and Cooper (1995) found that incentive payments were insufficient for adopting and maintaining some practices beyond 3 years. A survey of farmers in four regions was used to estimate farmers' willingness to adopt conservation tillage, split fertilizer applications, integrated pest management, legume crediting, manure crediting, and soil moisture testing given different incentive payment levels. The results indicated that 8 to 73 percent of the producers were willing to adopt certain practices without incentive payments because of the profitability of the practice (depending on the practices), provided that they are given sufficient information on the practice. Practices such as nutrient management, rotations, and conservation tillage have been shown to increase net returns in many areas, and these practices were the most popular in the WQIP. However, the study also found that at program payment levels, only conservation tillage and split applications were attractive to at least 50 percent of producers. Fifty-percent adoption for the other practices would require a substantial increase in the WQIP incentive payment, unless farmer concern over the impacts of farming operations on water quality can be increased through education.

  Lack of financial assistance may have slowed practice adoption in some Demonstration Projects. In the Wisconsin Demonstration Project, cost-share funds were available for less than half the farmers

wanting to adopt ICM (Finlayson and Erb, 1995). In addition, a lack of flexibility may be hindering the promotion and adoption of innovative practices. For example, the length of time required for an innovative practice with no national standards to be approved for financial assistance could have slowed project implementation (Rockwell and others, 1991).

- ***Local research on the economic and physical performance of recommended practices can improve practice adoption***. Farmers are skeptical of practices with "national" standards when there is no local history of use to readily observe. Project managers in eight USDA Demonstration Projects evaluated by the University of Wisconsin indicated the lack of data to support claims that certain BMP's are effective and economically advantageous (Rockwell and others, 1991). A number of projects diverted considerable resources to applied research to investigate the economic, environmental, and agronomic features of promoted practices (Nowak and O'Keefe, 1995). A research component to watershed projects for testing alternative management practices would accelerate the adoption process.

- ***Interaction with non-USDA agencies, organizations, and local businesses within a watershed is important***. Local districts such as soil and water conservation districts, drainage districts, irrigation districts, and natural resource districts may be operating in project areas. Local business and environmental groups may have some interest in water quality issues. Involving these stakeholders early in project planning would minimize future conflicts, and may bring in additional resources. Seeking and obtaining local cooperation has been identified as a strength of USDA Water Quality Program projects (Rockwell and others, 1991; Nowak and O'Keefe, 1995).

- ***More attention to and resources for water quality monitoring and project evaluation could help determine the cost-effectiveness of alternative practices and assist in the development of targeting strategies for program improvement***. Standardized reporting mechanisms that include economic information and water quality monitoring data provide the information necessary to understand both producer behavior and the efficacy of new practices. Lack of water quality monitoring in USDA Water Quality Program and Water Quality Incentive Projects has been cited as a reason why the ultimate impacts on water quality of many watershed projects may never be known (USDA, NRCS, 1996). Likewise, the lack of data on the economic impacts of the practices adopted with incentives provided by USDA limits the degree to which the effectiveness of implementation strategies can be evaluated.

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Recent ERS Reports Related to Water Quality Programs

The Conservation Reserve Program: Enrollment Statistics for Signup Periods 1-12 and Fiscal Years 1986-93, SB-925, November 1995 (C. Tim Osborn, Felix Llacuna, Michael Linsenbigler). The U.S. Department of Agriculture accepted about 33.9 million acres of cropland into the CRP during 1986-89. An additional 2.5 million acres were enrolled in 1991 and 1992 under significantly revised program rules.

Soil Erosion and Conservation in the Unites States: An Overview, AIB-718, Oct. 1995 (Richard Magleby, Carmen Sandretto, William Crosswhite, C. Tim Osborn). Soil erosion in the United States does not pose an immediate threat to the Nation's ability to produce food and fiber, but it does reduce the productivity of some soils, and it also causes water quality damage. USDA has initiated a number of programs for promoting soil conservation measures to farmers.

USDA's Water Quality Program Enters its 6th Year, AREI Update, 1995 No. 11 (Marc Ribaudo). Sixty-five water quality projects were started in 1995, and 6 projects were completed at the end of 1994. Over 400 water quality projects have been started since 1990.

Voluntary Incentives for Reducing Agricultural Nonpoint Source Water Pollution, AIB-716, May 1995 (Peter Feather and Joe Cooper). Data from the Area Studies are used to evaluate the success of existing incentive programs to control agricultural nonpoint source pollution. Because profitability drives production decisions, these programs tend to be most successful when they promote inexpensive changes in existing practices.

A Preliminary Assessment of the Integrated Crop Management Practices, ERS Staff Report AGES-9402, Feb. 1994 (C. Tim Osborn, D. Hellerstein, C. Matthew Rendelman, Marc Ribaudo, and Russ Keim). Analysis of the first year of ICM, based on a sample of four crops grown in four States, indicates limited success. The primary effect of ICM appears to have been reduced nitrogen fertilizer use.

Water Quality Benefits from the Conservation Reserve Program, AER-606, Feb. 1989 (Marc Ribaudo). The Conservation Reserve Program is estimated to generate between $3.5 and $4 billion in water quality benefits if it achieves its original enrollment goal of 40-45 million acres. Potential benefits include lower water treatment costs, lower sediment removal costs, less flood damage, less damage to equipment that uses water, and increased recreational fishing.

(Contact to obtain reports: Marc Ribaudo, (202) 501-8387 [mribaudo@econ.ag.gov])

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6.3 Conservation Reserve Program

After several years without new signups or significant new program activity, the Conservation Reserve Program (CRP) became active on multiple fronts in 1995 and 1996. In 1995, USDA allowed early release from CRP contracts, permitted 1-year extensions of contracts scheduled to expire in 1995, and held a 13th signup to replace early-out acres with more environmentally sensitive cropland. In 1996, USDA allowed a second early-out opportunity and another 1-year extension of expiring contracts. Also in 1996, the Federal Agriculture Improvement and Reform Act continued the CRP at a maximum of 36.4 million acres through the year 2002. In March 1997, USDA held a major signup based on new program rules that expanded land eligibility conditions, and revised rental payment limits and the environmental ranking acceptance process. Of 23.3 million acres offered, USDA accepted 16.1 million at an average rental fee of $39 an acre.

Contents

The Conservation Reserve Program (CRP), USDA's most ambitious conservation effort, was initiated by Congress in Title XII of the Food Security Act of 1985. As a voluntary long-term cropland retirement program, CRP provides participants (farm owners or operators) with an annual per-acre rent and half the cost of establishing a permanent land cover (usually grass or trees) in exchange for retiring highly erodible and/or environmentally sensitive cropland from production for 10-15 years. Although the enrollment mandate established in the 1985 Act was 40-45 million acres by the end of the 1990 crop year, by that point 33.9 million acres had been enrolled. The primary goal of the CRP during 1986-89 was to reduce soil erosion on highly erodible cropland. Secondary objectives included protecting the Nation's longrun capability to produce food and fiber, reducing sedimentation, improving water quality, fostering wildlife habitat, curbing the production of surplus commodities, and providing income support for farmers.

The Food, Agriculture, Conservation, and Trade Act of 1990 (1990 Farm Act) extended the CRP enrollment period through 1995, and redirected the goals of the CRP toward improving water quality and other environmental concerns. Under the 1990 Act, an additional 2.5 million acres were enrolled, bringing total enrollment to 36.4 million acres as of 1993. Subsequent appropriations legislation capped CRP enrollment at 38 million acres. In April 1996, President Clinton signed the Federal Agricultural Improvement and Reform Act (1996 Farm Act), continuing the CRP through 2002. Under this legislation, USDA was given authority to re-enroll existing CRP contracts, as well as enroll new acres, subject to a maximum annual enrollment of 36.4 million acres.

Table 6.3.1—Conservation Reserve Program activity, 1986-96

Event	Number of acres	Average rental payment when in CRP	Average erosion reduction when in CRP
	Million acres	*$/acre/year*	*Tons/acre/year*
Signup #1, March 1986[1]	0.75	42.06	26
Signup #2, May 1986	2.77	44.05	27
Signup #3, August 1986[2]	4.70	46.96	25
Signup #4, February 1987[3]	9.48	51.19	19
Signup #5, July 1987	4.44	48.03	17
Signup #6, February[4]	3.38	47.90	18
Signup #7, July 1988	2.60	49.71	17
Signup #8, February 1989[5]	2.46	51.04	14
Signup #9, July-August 1989	3.33	50.99	14
Signup #10, March 1991[6]	0.48	53.66	17
Signup #11, July 1991	1.00	59.37	15
Signup #12, June 1992	1.03	62.98	16
Early-out #1, May 1995	-0.70	58.51	20
Signup #13, September 1995[7]	0.62	53.93	10
1995 expirations	-0.13	46.36	26
Early-out #2, 1996	-0.77	57.41	17
1996 expirations	-0.96	60.51	22
Net enrollment, Dec. 1996[8]	32.96	49.20	19

[1] Eligible acres included cropland in land capability classes II-V eroding at least three times greater than the tolerance rate, or any cropland in land capability classes VI-VIII. [2] Eligible acres expanded to include cropland in land capability classes II-V eroding at least two time the tolerance rate and having gully erosion. [3] Eligible acres expanded to include cropland eroding above the tolerance rate with an erodibility index of 8 or greater. [4] Eligible acres expanded to include cropland in land capability classes II-V eroding at least two times the tolerance rate if planted in trees. Eligibility also extended to cropland areas 66-99 feet wide adjacent to permanent water bodies for placement in filter strips. [5] Eligible acres expanded to include cropped wetlands and cropland areas subject to scour erosion. [6] Eligible acres expanded to include cropland devoted to easement practices, cropland in State water quality areas, cropland in conservation priority areas, and cropland within established wellhead protection areas. Farmed wetlands, even if otherwise eligible, were ineligible for enrollment. [7] Eligible acres included fields with an average erodibility index greater than or equal to 8, cropland areas with evidence of scour erosion caused by out-of-bank water flows and floods occurring in at least one out of 10 years, wellhead protection areas identified by the Environmental Protection Agency, any cropland determined suitable for riparian buffer/filterstrips by NRCS, small farmed wetlands contained in and part of a field that were otherwise eligible, or any cropland located in the Chesapeake Bay region watershed, the Great region watershed, the Long Island Sound watershed, other areas designated as conservation priority areas in CRP signup 12, and newly approved State priority areas. [8] Net after subtracting 1.5 million acres terminated by producers prior to 1995 early-out.

Source: USDA, ERS, based on CRP contract data.

Program Status Up to the 1996 Farm Act

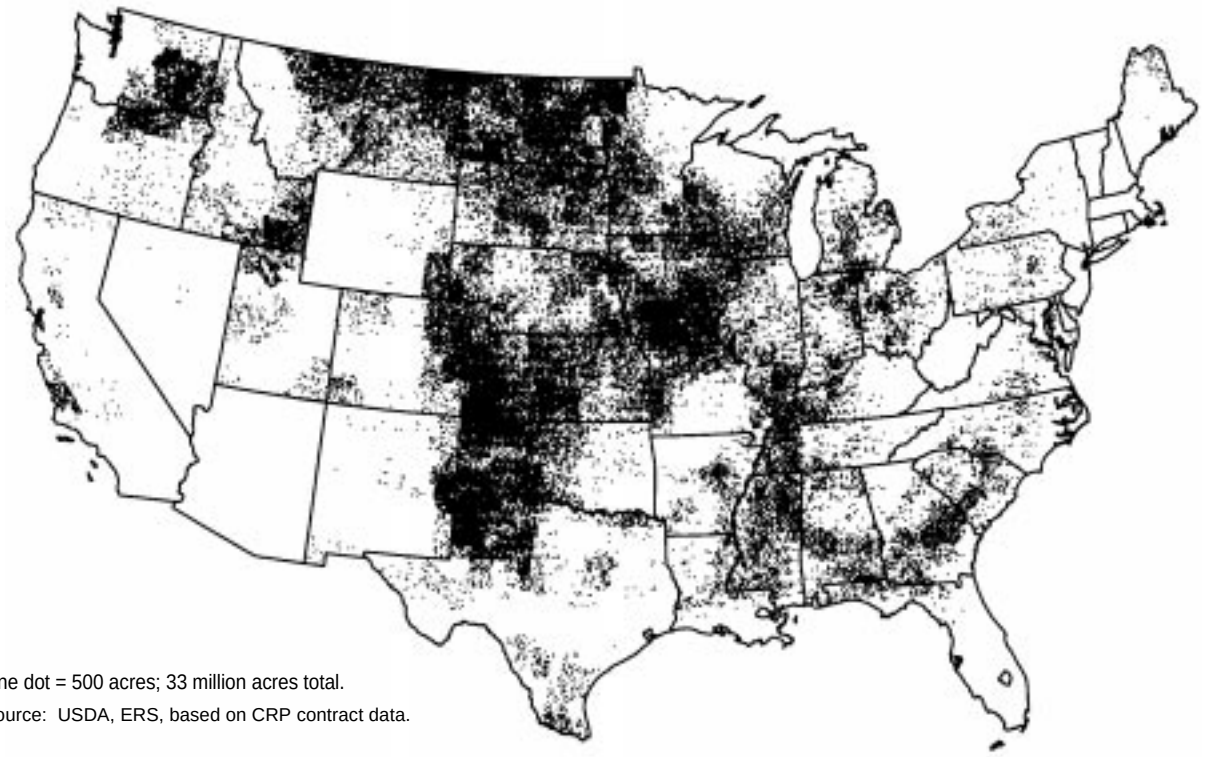
After 12 years, as of December 1996, the CRP contained approximately 33 million acres of idled cropland (table 6.3.1). This is less than the 37.0 million acres enrolled in signups 1-13 due to 704,000 acres removed in the May 1995 early-out, 1.5 million acres from contracts previously terminated by producers, 126,000 acres scheduled to expire in 1995 and not extended by producers, 768,000 acres removed under 1996 early-out authority, and 956,000 acres scheduled to expire in 1996 and not extended (table 6.3.2).

CRP acres (December 1996) were concentrated in the Great Plains and western Corn Belt (table 6.3.2, fig. 6.3.1). Annual CRP rental payments averaged about $49 per acre. Annual erosion reductions for the acreage in the program as of December 1996 totaled 626 million tons, or about 19 tons per acre. This is a 20-percent reduction in cropland erosion compared with conditions prior to the CRP. Most CRP acres were planted to grass, but the CRP also included 2.4 million acres of trees, 1.6 million acres of special wildlife practices (e.g. habitat, shallow water area), and 8,100 miles of filter strips along waterways.

Early-Outs and Contract Extensions in 1995

On December 14, 1994, the Secretary of Agriculture announced that, under authority of the 1985 and 1990 Farm Acts, USDA would (1) allow participants to be released early from contracts (or to reduce the number of acres under contract), and (2) allow producers with contracts expiring in 1995 to extend their contracts 1 year.

Figure 6.3.1--Acres under CRP contract, December 1996



One dot = 500 acres; 33 million acres total.

Source: USDA, ERS, based on CRP contract data.

Table 6.3.2—Remaining regional CRP enrollment, December 1996

Region	Enrolled in signups 1-12	Terminated by producers prior to early-out opportunity	Terminated by producers in early-out opportunity, May 1995	Enrolled in replacement signup 13, Sept. 1995	Unextended contracts that expired in 1995	Terminated by producers in 1996 early-out	Unextended contracts that expired in 1996[2]	Remaining enrollment[1]
				1,000 acres				
Appalachian	1,158	-54	-66	19	-20	-19	-97	922
Corn Belt	5,603	-126	-245	193	-23	-198	-383	4,821
Delta	1,248	-48	-18	47	-12	-9	-31	1,177
Lake States	3,008	-142	-96	68	-11	-185	-84	2,559
Mountain	6,687	-137	-62	76	-14	-100	-84	6,365
Northeast	226	-17	-9	10	-3	-5	-9	194
Northern Plains	9,664	-732	-96	100	-14	-144	-142	8,635
Pacific	1,791	-27	-14	18	-5	-27	-27	1,708
Southeast	1,693	-130	-22	28	-14	-10	-32	1,512
Southern Plains	5,343	-116	-75	58	-11	-71	-65	5,064
U.S.[1]	36,423	-1,528	-704	616	-126	-768	-956	32,956

[1] May not add across or down because of rounding.

[2] Includes acres terminated during Oct.-Dec. 1996 (FY 1997).

Source: USDA, ERS, based on FSA data on CRP contracts.

During May 15-June 2, 1995, CRP participants were permitted to request early contract releases without penalty or obligation to refund previous payments issued under the CRP. Prior to this opportunity, participants had been required to refund past CRP rental payments plus interest, liquidated damages, and, in many cases, cost-share payments previously paid under the contract. The early release was designed to replace these acres with more environmentally sensitive cropland under new CRP contracts, and to allow the released acres to produce additional grain given low stocks.

A number of conditions were in effect for the early release opportunity. First, certain environmentally sensitive CRP acres were ineligible. These included acres within 100 feet of a stream or other water body, acres covered by a CRP easement, and acres containing grass waterways, filter strips, shallow water areas for wildlife, bottomland timber on wetlands, field windbreaks, and shelterbelts established by the CRP. If the released CRP acres were to be cropped, eligibility for certain USDA benefits required they be farmed according to a Basic Conservation System (BCS), at least until the date the CRP contract would have expired. A BCS reduces soil erosion to the soil-loss tolerance level—the rate of soil erosion above which long-term soil productivity may be depleted. This is a higher, and potentially more costly, level of erosion control, than an Alternative Conservation System (ACS) which is required of highly erodible cropland and CRP acres after contracts expire. If the released CRP acres were to be hayed or grazed, they had to be managed in accordance with an approved haying or grazing plan determined by the Natural Resource Conservation Service (NRCS). Crop acreage bases, allotments, and quotas associated with the released CRP acres could not be reinstated until the 1996 crop year, making deficiency payments unavailable for 1995 even if released acres were planted that crop year. Finally, the effective date of the release could not exceed September 30, 1995.

It had been estimated that CRP participants could potentially opt to end contracts early on as many as 4.5 million acres. However, perhaps due to the lateness of the early-out opportunity in the crop year and the conditions listed above, producers requested early release on just 704,000 acres. Iowa had the most acres removed, followed by Texas and Minnesota. Regionally, early-out acres were greatest in the Corn Belt (245,000), followed by the Lake States (96,000) and the Northern Plains (96,000) (table 6.3.2).

Also, during May 15-June 2, 1995, CRP participants with contracts expiring September 30, 1995 (approximately 2 million acres) were allowed to submit requests to extend their contracts for 1 additional year. This opportunity was to help these participants whose contracts were expected to expire before passage of the farm bill make informed decisions about the use of their CRP acres in light of changes to conservation and commodity programs contained in new farm legislation. Of the acres scheduled to expire in 1995, 25,000 elected early-out in May, 1.7 million were extended for 1 year, and 126,000 expired on schedule. The additional government cost of extending the 1.7 million acres for 1 year was approximately $70 million.

Targeted 1995 Replacement Signup

To replace the acres granted early release in June 1995, USDA held a 13th CRP signup during September 11-22, 1995 to accept bids for new 10-15 year contracts. This was the first signup since June 1992. To enroll acres with the highest environmental benefits relative to government cost, bids were ranked by an environmental benefits index, much as in signups 10-12. However, substantial changes were made, among them:

- Cropland eligibility criteria were modified from past signups.
- Producers were given open access to information on how the environmental benefits index was calculated and on the maximum rental payment the Government would accept for their cropland based on their soil's productivity.
- States could develop their own bid-ranking process to be used in place of the national process. Colorado, Missouri, Nebraska, and Oregon developed their own processes.
- Environmental Priority (EP) bids, such as filter strips along waterways, were eligible for a 10-percent rental bonus to promote their enrollment.

Cropland eligible for enrollment included fields with an average erodibility index greater than or equal to 8. This criteria removed land capability class as a definition for highly erodible acres under CRP and replaced the two-thirds field predominance requirement used in previous signups. Eligibility also included cropland with evidence of scour erosion caused by out-of-bank water flows and floods occurring in at least 1 out of 10 years; wellhead protection areas identified by the Environmental Protection Agency; any cropland determined suitable

Table 6.3.3—Results of the 13th CRP signup, September 1995

Region	Acres bid	Acres accepted and contracted	Acres with trees	Average rental rate	Average erosion reduction
	1,000 acres			*$/acre/yr*	*tons/acre/yr*
Appalachian	29	19	4	54.92	11
Corn Belt	423	193	8	80.93	9
Delta	71	47	40	40.53	10
Lake States	144	68	8	59.13	6
Mountain	139	76	0	30.76	8
Northeast	16	10	0	43.95	5
Northern Plains	179	100	0	39.71	7
Pacific	30	18	0	49.00	8
Southeast	42	28	20	38.52	9
Southern Plains	101	58	0	32.45	25
U.S.	1,174	616	80	53.79	10

Source: USDA, ERS, based on FSA data on CRP contracts.

for riparian buffer/filterstrips by NRCS; small farmed wetlands contained in and part of a field that was otherwise eligible; and any cropland located in the Chesapeake Bay region watershed, the Great Lakes region watershed, the Long Island Sound watershed, other areas designated as conservation priority areas in CRP signup 12, and newly approved State priority areas.

A national ranking process was used to determine the amount of acreage to be approved in each State and to determine the actual acceptance of bids in States that did not develop their own process. The environmental benefits index used in the national ranking process was comprised of five factors, four characterizing the environmental contributions of each parcel offered and one characterizing the government cost of enrolling each parcel. The environmental factors included water quality protection (both ground water and surface water; a maximum of 20 points), creation of wildlife habitat (a maximum of 20 points), control of soil erodibility (a maximum of 20 points), and tree planting (a maximum of 10 points). The cost factor was based on the annual rental rate requested by the producer. For two bids with the same environmental score, the bid with the lower per-acre cost received a higher ranking in both the national and State ranking plans. In addition, certain acres categorized as EP bids (partial-field bids devoted exclusively to filter strips, shallow water areas for wildlife, field windbreaks, shelter belts, etc.) automatically received maximum environmental factor scores under both national and State ranking plans.

During the signup, USDA informed each applicant of the maximum annual per-acre rental payment the Government would accept (bid cap) for the cropland offered based on the soil's productivity. Applicants were free to request any rental amount, but bids that exceeded the bid cap were rejected at the county level. Applicants could increase their likelihood of bid acceptance by bidding less than the cap.

In total, 1.17 million acres were offered for enrollment by landowners and operators in the 13th signup (table 6.3.3). Of these, 683,000 were accepted to replace the acres removed in the May 1995 early-out opportunity, and of these, producers entered into contracts on 616,000 acres. The average annual rental cost for land accepted in the 13th signup was $53.79 per acre, significantly less than recent signups. The average erosion reduction for accepted acres was lower than under previous signups at 10 tons per acre per year. Thirty-one percent of accepted acres were located in the Corn Belt region, while 38 percent were from the Great Plains States (Northern Plains, Southern Plains, and Mountain regions). Most acres (80 percent) were planted with grass, but tree planting accounted for 80,000 acres (13 percent) and filter strips accounted for 31,000 acres (5 percent). The filter strip enrollment from the 13th signup represented a 58-percent increase in total CRP filter strip acres.

Early-Outs and Contract Extensions in 1996

On March 14, 1996, the Secretary of Agriculture announced a second early-out opportunity for March 20-April 26, 1996. This opportunity pertained to

CRP contracts scheduled to expire in September 1996, covering more than 14 million acres. As with the 1995 early-out opportunity, certain environmentally sensitive acres such as filter strips, acres within 100 feet of a stream or other water body, and grass waterways were not eligible. In addition, CRP acres with an erodibility index greater than 15 were ineligible. Unlike the 1995 early-out, producers that returned their released acres to crop production needed only adopt an Approved Conservation System to be eligible for USDA program benefits; and acreage bases, allotments, and quotas were restored for the 1996 crop year. USDA took this action to allow farmers to take advantage of high grain prices, to ensure higher production to meet demand, and meet the administration's commitment to an environmentally sound and cost-effective CRP. This early-out opportunity was later eclipsed by the passage of the 1996 Farm Act, which provided authority for producers to withdraw most lands from the CRP at any time, subject to 60-day notice to USDA. As of December 1996, nearly 768,000 acres were removed from the CRP under the 1996 early-out authority (table 6.3.2).

In addition to the early-out option, producers were allowed to extend their expiring 1996 contracts 1 year at existing rental rates during March 20-April 26, 1996. In announcing the signup period, the Secretary said, "A 1-year extension is the most prudent option until a new farm bill is enacted giving USDA enrollment authority and establishing a longer-term policy for the CRP." Operators chose to extend contracts on all but 956,000 acres (table 6.3.2).

Program Changes and Status Under the 1996 Farm Act

The new Federal Agricultural Improvement and Reform Act (1996 Farm Act), signed into law in April 1996, continued the CRP at a maximum of 36.4 million acres through the year 2002, and allowed USDA to enroll new acres in addition to re-enrolling existing CRP acres. The Act also provided authority for producers with contracts established before January 1, 1995, that have been in effect for at least 5 years, to withdraw from the CRP at any time subject to 60 days notice to USDA. However, CRP acres with filterstrips, grass waterways, riparian areas, windbreaks, shelterbelts, acres having an erodibility index greater than 15, and other lands with high environmental benefits as determined by the Secretary (including wetlands) are ineligible for early withdrawal. Producers will receive prorated rental payments for contracts that are withdrawn before the end of a fiscal year. The 1996 Act further stipulated that early withdrawal of a CRP contract shall not affect the ability of the owner or operator to submit a bid to re-enroll the land in the CRP at a future date. Finally, conservation requirements under conservation compliance, sodbuster, and swampbuster for CRP lands returned to production must be no more onerous than those required for similar lands in the area.

Continuous 14th Signup

Under the authority of the 1996 Farm Act, on September 4, 1996, USDA began a continuous CRP signup (referred to as the 14th signup) for filter strips, riparian buffers, grassed waterways, field windbreaks, shelterbelts, living snow fences, salt-tolerant vegetation, shallow water areas for wildlife, and wellhead protection areas designated by EPA. These partial-field practices involve a small amount of acreage, but provide disproportionately large environmental benefits. Producers wishing to enroll acres devoted to these practices may do so at any time, avoiding the need to wait for a discrete CRP signup period. If the producer is willing to accept no more than a maximum productivity-adjusted payment rate calculated by FSA, these acres will be automatically accepted. In addition, special bonus payments may also be available to attract certain high-priority practices.

15th Signup in March 1997

In early 1997, CRP acreage acceptance rules were finalized for a 15th signup opportunity March 3-28, 1997. The new rules expanded the base of eligible lands to more than 240 million acres, including about 65 percent of U.S. cultivated cropland, compared with around 100 million acres of highly erodible cropland eligible when the CRP was first initiated (table 6.3.4).

Table 6.3.4—Lands eligible for CRP signup, based on the 1996 Farm Act

Category	Million acres
Highly erodible cropland	142
Cropland in national priority areas	86
Cropland in State priority areas	24
Cropland adjacent to water bodies	13
Cropped wetlands and adjacent upland	8
Pastureland adjacent to water bodies	na
Total CRP land eligibility[1]	240

na = Not available.

[1] Excludes minor categories of eligible land and double-counting of acres falling into more than one category.

Source: USDA, ERS, based on FSA analysis.

Table 6.3.5—Results of the 15th CRP signup, March 1997

Region	Acres offered for enrollment	Acres accepted	Accepted acres formerly in CRP	Average rental rate	Existing or new tree acres accepted	Wetland restoration acres accepted	Average erodibility index
	1,000 acres		*Percent*	*$/acre/yr*		*1,000 acres*	
Appalachian	498.9	348.6	89.9	55	56.3	0.0	32
Corn Belt	2,787.0	1,670.4	81.2	70	40.0	7.1	27
Delta	674.8	613.5	80.9	37	442.7	9.2	24
Lake States	1,490.4	637.1	74.5	52	55.2	39.9	13
Mountain	5,443.1	4,132.1	71.7	32	3.6	1.6	15
Northeast	99.9	90.4	70.8	43	3.3	0.1	23
Northern Plains	6,026.1	5,050.3	67.6	36	5.3	724.3	10
Pacific	1,322.2	606.9	84.6	40	3.7	5.2	15
Southeast	781.8	584.7	86.2	37	440.9	0.5	15
Southern Plains	4,144.8	2,413.0	68.2	33	6.4	1.5	16
U.S.	23,269.1	16,147.0	72.7	39	1,057.5	790.3	16

Source: USDA, ERS, based on FSA CRP summary tables.

The additional eligible lands were mostly cropland in national and State environmental priority areas, cropland adjacent to water bodies, and cropped wetlands and adjacent upland.

Producers that wished to enroll eligible land with practices not covered by the continuous signup, including eligible acres from the 21.5 million acres with CRP contracts then scheduled to expire in 1997, had to submit bids for their land and compete with other bids for acceptance. Offers of eligible land were ranked using an environmental benefits index (EBI). The EBI for the 15th signup was composed of the sum of 6 environmental factors and a cost factor: wildlife habitat benefits (100 points maximum); water quality benefits from reduced water erosion, runoff, and leaching (100 points maximum); onfarm benefits of reduced wind or water erosion (100 points maximum); long-term benefits of cover beyond the contract period (50 points maximum); air quality benefits from reduced wind erosion (25 points maximum); benefits from enrollment in conservation priority areas (25 points maximum); and cost (200 points maximum).

On May 22, 1997, USDA accepted 16.1 million acres for enrollment in the CRP from the 15th signup period. Approximately 23.3 million acres had been offered by producers. Of the acres accepted, 4.4 million represented new acres not formerly enrolled in the program. The regional distribution of accepted acres was similar to the historic CRP except for small reductions in the Lake States and Pacific Regions, and a small increase in the Mountain Region (table 6.3.5).

The average environmental index (EBI) score for the acres enrolled in the 15th signup (307) was 46 percent greater than the average EBI of the historic CRP (210) owing mainly to improved wildlife habitat benefits, water quality benefits, and decreased rental costs. Approximately 84 percent of accepted acres were highly erodible, and nearly half of these acres had an erodibility index greater than 15. The average erodibility index for accepted acres was 16. Approximatley 1.1 million of the accepted acres were devoted to new or existing trees, while most of the remainder will be covered with various grasses. Included in the acres accepted in the 15th signup were over 790,000 acres of cropped wetland and associated acreage that will be restored and over 652,000 acres that were enrolled in State water quality areas.

Due to revised soil bid caps and enhanced program competition, annual rental costs were reduced from an average of $50 per acre under the historic CRP to $39 on the 15th signup accepted acres. In addition, over 60 percent of rental payments requested by producers were below established USDA soil bid caps. Based on the improved EBI and the lower rental cost, USDA announced that the newly accepted acreage

Wildlife Benefits of the Conservation Reserve Program

The CRP provides exceptional opportunities to enhance habitat for grassland-dependent birds and other wildlife. Lands enrolled in the CRP are extensive enough that they can have large-scale effects on populations of both game and nongame species. In some areas, CRP lands now represent the majority of available grassland habitat for wildlife. The CRP has created new grassland habitat for wildlife on an area twice the size of all national wildlife refuges and all State wildlife areas within the contiguous 48 States (Wildlife Management Institute, 1994).

Numerous studies have documented increased reproduction and diversity of game and nongame species in areas where CRP land is present. The CRP has been beneficial to many grassland wildlife species, including regular game birds (pheasants and ducks) and other species (lesser prairie chicken and the formerly endangered greater prairie chicken). Big-game wildlife such as elk, mule deer, white-tailed deer, and pronghorn antelope have also responded favorably to habitat improvement on CRP land in Western States.

CRP also improves aquatic habitats by reducing discharge of soil sediment and agricultural chemicals. Impacts would be most noticeable in rural watersheds dominated by agricultural activity. Improved aquatic habitat implies healthier and more diverse fish populations and enhanced recreational fishing opportunities.

Beneficial impacts on wildlife populations generate welfare benefits for those who participate in consumptive (hunting) and non-consumptive (observing) recreation activities. Even though no cash transactions may be involved, participants place a value on an increase in the quality of the recreation activity.

Estimating the environmental economic benefits of the CRP is difficult and imprecise due to the nonmarket nature of these effects. One study has estimated that benefits for small game hunting total about $3 billion for acres enrolled in the CRP (total over life of current contracts, not annual) (Ribaudo and others, 1990). Economic benefits from improved waterfowl hunting because of CRP are estimated to total $1.4 billion (Johnson and others, 1994). An estimate of benefits for nonconsumptive wildlife use (birdwatching, etc) totals $4.1 billion (Johnson and others, 1994). Freshwater fishing benefits are estimated to total $310 million (Ribaudo, 1989).

represented an 85 percent increase in the CRP's environmental cost-effectiveness (USDA, 1997).

Another CRP signup is planned for the fall of 1997.

Scheduled Contract Expirations

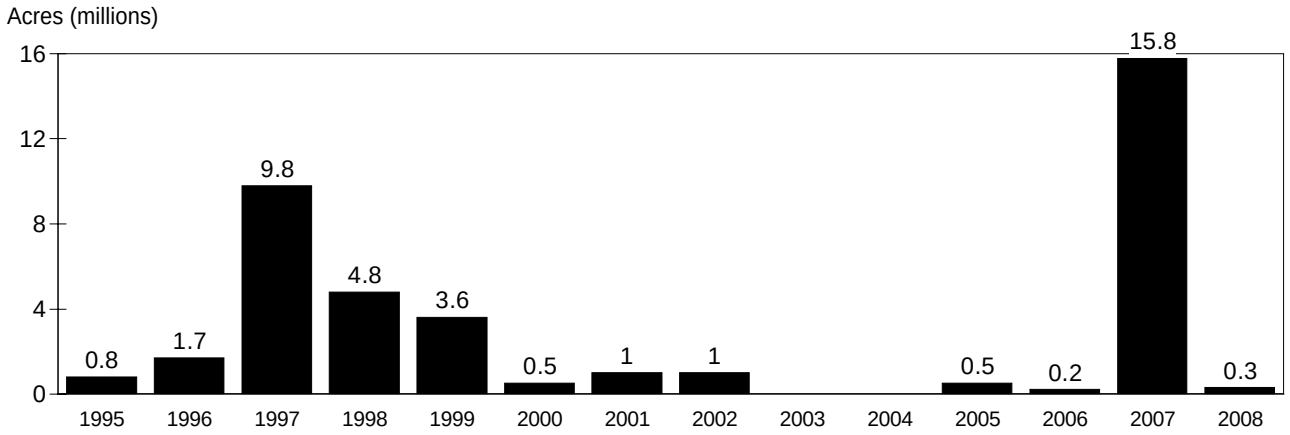
At the end of the CRP contract period, annual rental payments made by USDA to CRP contract-holders cease, and producers may decide the next use of their land. If the land is returned to crop production and it is highly erodible, producers must adopt an approved alternative conservation system to meet Conservation Compliance requirements for retaining eligibility for USDA farm program benefits. CRP contract expirations in 1995 and 1996 were small due to the 1-year contract extension options granted producers in these years (fig. 6.3.2). However, combining extended contract acres with acres from contracts scheduled to expire on September 30, 1997, brought anticipated 1997 contract expirations to 21.5 million acres. However, 11.7 million of these acres were accepted for new contracts in the 15th signup, leaving 9.8 million expected to expire in 1997.

Approximately 4.8 million acres are scheduled to expire in 1998, and 3.6 million acres in 1999.

Program Cost, Benefits, and Effectiveness

By idling highly erodible or other environmentally sensitive cropland, the CRP produces a wide range of physical and economic effects. Some effects, such as improved environmental quality and higher food costs, represent changes in the quantity or quality of real goods and services valued by society. These are the social benefits and costs. Other effects, including the disbursement of annual CRP rental payments and reduced outlays for USDA commodity programs, are not changes to real goods or services but to transfer payments between regions or sectors of the economy. Due to this fundamental difference, the overall effect of the CRP cannot be determined by simply adding up all the individual effects without regard to whether they represent real changes to social welfare or are merely transfer payments. Two separate accounting frameworks are necessary. The first focuses on CRP's net effect on social welfare, while the second

Figure 6.3.2--Schedule of CRP contract expirations, May 1997



1997 is net after subtracting 11.7 million acres scheduled to expire in 1997 but accepted for new contracts in the 15th signup.

Source: USDA, ERS, based on FSA data on CRP contracts.

summarizes the program's net effect on government spending.

For social welfare, it is necessary to estimate product and service value changes that occur with and without the CRP. In 1990, when the CRP stood at 33.9 million acres, ERS estimated net social benefits of $4.2-$9 billion in present value over the life of the program (Osborn and Konyar, 1990). This is the extent to which the social benefits of the CRP exceeded its social costs. Social benefits included increases in net farm income ($2.1-$6.3 billion), the value of future timber ($3.3 billion), preservation of soil productivity ($0.6-$1.7 billion), improved surface-water quality ($1.3-$4.2 billion), lower damages due to windblown dust ($0.3-$0.9 billion), and enhanced small-game hunting ($1.9-$3.1 billion). Social costs included higher food costs to consumers ($2.9-$7.8 billion), costs of establishing vegetative cover on CRP acres ($2.4 billion), and USDA technical assistance ($0.1 billion). Since then, the U.S. Fish and Wildlife Service has estimated additional wildlife benefits of $1.4 billion for waterfowl hunting, and $4.1 billion for nonconsumptive wildlife benefits, making wildlife the largest benefit category for the CRP and bringing overall net benefits of the CRP to $9.7-$14.5 billion (see box, "Wildlife Benefits of the Conservation Reserve Program").

In 1990, ERS also estimated the net government cost (the second evaluation framework) of the CRP at $6.6-$9.3 billion in present value over the life of the program. Program expenses were estimated at $14.6 billion in present value, of which $13 billion represented annual rental payments. Commodity program cost savings were estimated at $5.3-$8 billion. However, estimates of commodity program savings are very sensitive to assumptions about annual acreage reduction programs that would exist in the absence of the CRP. Estimates of commodity program savings, for example, would be much smaller if it were assumed that annual acreage reduction programs in the absence of the CRP would be larger.

While the CRP has provided significant conservation and environmental benefits, especially for wildlife, most agree that the overall program could have been structured to provide even greater benefits. In addition, the government cost of enrolling some CRP acres could have been lower, particularly in the Great Plains. Experience of program implementation before and after passage of the 1990 Farm Act shows that (1) active targeting of bids based on relative comparisons of environmental benefits and contract costs improves program cost-effectiveness, and (2) consideration of the productivity of the acres offered in each bid can reduce the likelihood of overpayment.

Signups 1-9, conducted under authority of the 1985 Farm Act, were subject to mandatory minimum annual enrollment levels as established in the Act. In an effort to meet these enrollment levels, USDA did

Recent ERS Reports on the Conservation Reserve Program

The Conservation Reserve Program: Enrollment Statistics for Signup Periods 1-12 and Fiscal Years 1986-93, SB-925, Nov. 1995 (C. Tim Osborn, Felix Llacuna, and Michael Linsenbigler). Through the 12th signup, 36.4 million acres had been enrolled in the CRP with an average annual rental cost of $49.67 per acre and an average annual erosion reduction of 19 tons per acre.

"Changes in Store for CRP," *Agricultural Outlook,* Sept. 1995 (C. Tim Osborn). Administration actions on the CRP as of 1995 are reviewed as are proposals for the future of the CRP, including legislative proposals by members of Congress, the Senate Agriculture Committee's early version of the conservation title, and the administration's farm policy guidelines.

Expiration of Conservation Reserve Program Contracts, AIB-664-2, April 1993 (C. Tim Osborn and Ralph E. Heimlich). Outlines the imminent expiration of CRP contracts, what is at stake, and alternative policy options.

"A Fresh Look at the CRP," *Agricultural Outlook,* Aug. 1990 (C. Tim Osborn and Kazim Konyar). Based on the 33.9 million acres enrolled in signup periods 1-9, net economic benefits of the CRP were estimated to be $4.2-$9 billion in present value over the life of the program. This included benefits to farm income, timber production, soil productivity, water quality, wildlife, and air quality.

The Conservation Reserve Program: An Economic Assessment, AER-626, Feb. 1990 (C. Edwin Young and C. Tim Osborn). The net economic benefits of a 45-million acre CRP were estimated to be $3.4-$11 billion in present value over the life of the program (1986-1999). Effects of placing less emphasis on soil erosion control and more emphasis on forestry and environmental benefits were also examined.

Natural Resources and Users Benefit from the Conservation Reserve Program, AER-627, Jan. 1990 (Marc O. Ribaudo, Daniel Colacicco, Linda L. Langner, Steven Piper, and Glenn D. Schiable). This report provides detailed natural resource benefit estimates resulting from the CRP, including soil productivity, water quality, air quality, wildlife habitat, and groundwater supply.

(Contact to obtain reports: C. Tim Osborn, (202) 219-1030 [tosborn@econ.ag.gov])

not rank bids in signups 1-9. Rather, bids were accepted as long as (1) ownership and land eligibility criteria were met, and (2) the rental rate requested by the producer did not exceed a USDA maximum acceptable rental rate (MARR) established for a multicounty area or State. Therefore, an eligible parcel with twice the erodibility of another eligible parcel had no greater priority for enrollment. In addition, USDA established only one MARR for each area and this amount eventually became known to producers. As a result, producers could receive rental payments in excess of prevailing cash rents for enrolling less productive land. Also, MARR's were sometimes set too high in relation to average cash rents, primarily in the Great Plains, also contributing to overpayment.

Based on the need to enroll only a limited amount of additional acreage during 1990-95, under authority of the 1990 Farm Act, USDA actively ranked bids for acceptance in CRP signups 10-13. The ranking processes were designed to select acreage that provided the greatest conservation and environmental benefits relative to the government cost of enrollment. In addition, to reduce overpayment, new rental rate screening processes were instituted.

In signups 10-12, the rental payment requested by a producer was screened against a soil productivity-adjusted estimate of the rent that could be earned on comparable local cropland. Bids that exceeded this amount, adjusted for other costs incurred by producers due to CRP participation, were rejected. The bid screen amounts used in these signups were not related to the MARR's in signup periods 1-9. Next, eligible easement bids, primarily filterstrips, and wellhead protection bids that survived the rental rate screen were automatically approved for CRP enrollment. These bids typically involve a limited number of acres and a small government cost,

but provide significant conservation and environmental benefits. Finally, standard bids that survived the rental rate screen were ranked for acceptance based on the ratio of an environmental benefits index (EBI) to the government cost of the contract. In signups 10-12, the EBI was comprised of seven coequal indicators (surface-water quality, groundwater quality, soil productivity, conservation compliance assistance, tree planting, Hydrologic Unit Areas identified by the USDA Water Quality Initiative, and conservation priority areas). When submitting a bid, producers were not informed of the rental rate screen amount for their soil or how the EBI was calculated. Approximately 2.5 million acres were enrolled in signups 10-12. As discussed earlier, in signups 13 and 15, revised EBI's were used to rank bids and rental rate requests were screened against productivity-based soil rental rates that were announced during the signups.

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6.4 Conservation Compliance

The 1985 Food Security Act introduced the Conservation Compliance and Sodbuster programs to combat soil erosion. These programs require farmers to implement approved soil conservation systems on highly erodible land (HEL) in order to receive certain USDA program benefits. These programs, along with other measures, have significantly reduced erosion on U.S. cropland. In 1995, approved conservation plans were being applied to nearly 90 million acres of cropped HEL, while an additional 30 million acres of HEL were enrolled in the Conservation Reserve Program. Major soil conservation practices implemented include conservation cropping sequences, crop residue use, and conservation tillage.

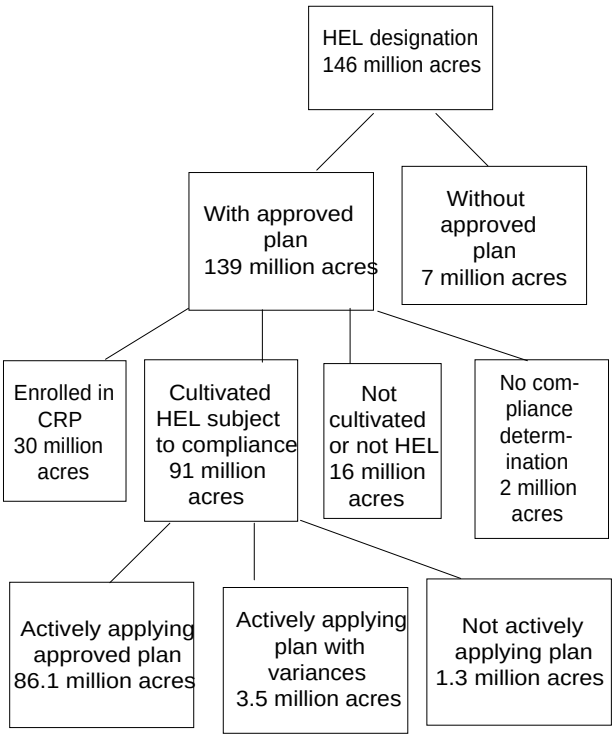
Contents

The Food Security Act of 1985 (1985 Farm Act) was drafted during a period of high agricultural support payments and growing concern about the environmental and productivity consequences of soil erosion. In 1982, cultivated HEL[1] accounted for nearly 60 percent of total erosion on U.S. cropland (USDA, NRI, 1994). The 1985 Farm Act introduced two new programs affecting farmers who cultivate crops on HEL: the Conservation Compliance Program and the Sodbuster Program.[2] Both programs required farmers to implement approved soil conservation systems on cultivated HEL in order to receive certain USDA program benefits. Conservation Compliance applied to HEL previously cultivated in any year between 1981 and 1985. It required farmers producing crops on HEL to implement and maintain a soil conservation system approved by the Natural Resources Conservation Service (NRCS) on that land by 1995. These conservation systems achieve a substantial reduction in soil erosion on a field or group of fields containing HEL. HEL placed into the Conservation Reserve Program (CRP) is also considered to be in compliance. The stricter Sodbuster Program applied to HEL not cultivated during 1981-85. Sodbuster required farm program participants bringing HEL under cultivation to apply basic soil conservation systems. Basic systems are intended to reduce soil erosion to the soil tolerance level (T): the rate above which long-term soil productivity may be depleted. This is a higher level of erosion control than often required under

[1] HEL cropland was estimated using NRI points with an erodibility index greater than or equal to 8. In practice, HEL cropland is a field, not a point determination.

[2] The Conservation Reserve Program was a third major program introduced in the 1985 Farm Act to control soil erosion (see chapter 6.3).

Figure 6.4.1--Status of highly erodible land, 1995



Source: USDA, ERS, based on NRCS 1995 Status Review.

Conservation Compliance. Under both programs, farmers who continued to cultivate HEL without implementing an approved conservation system would be ineligible to receive Commodity Credit Corporation price supports or payments, CRP payments, farm storage facility loans, disaster payments, Consolidated Farm and Rural Development or Farmers Home Administration loans, or Federal Crop Insurance. However, this provision was modified under the Food, Agriculture, Conservation and Trade Act of 1990, giving the Secretary of Agriculture discretion to determine that a person, although in violation, acted "in good faith" without the intent to violate Conservation Compliance requirements. In such cases, the person's payments may be reduced by not less than $500 nor more than $5,000, but the person would remain eligible to participate in USDA programs if the violation were corrected.

The Federal Agricultural Improvement and Reform Act (1996 Farm Act) made further changes in provisions governing cultivation on HEL. First, the 1996 Act made compliance no longer a requirement for Federal Crop Insurance. Second, the Act eliminated distinction between HEL cultivated from 1981 to 1985 and HEL brought under cultivation after 1985, doing away with the Sodbuster Program. Newly cultivated HEL may use conservation systems other than the basic systems previously required under Sodbuster. Alternative systems can be applied where they do not result in substantially higher soil erosion. However, alternative conservations systems may not always adequately prevent a substantial increase in soil erosion when converting HEL fields from native vegetation. In these cases, basic conservation systems may still be required.

The 1996 Farm Act also included several modifications to reduce compliance and monitoring costs. These include: (1) expedited variances for timely responses to producer requests for relief from climatic or economic hardship; (2) grace periods for good-faith violations to provide producers with unintended violations to come into compliance without penalty; (3) onfarm conservation research authority to examine innovative conservation systems; and (4) provisions to allow farmers to report residue measurements.

Status of Conservation Compliance: 1995

About 146 million acres, roughly one-third of total U.S. cropland, had been designated as HEL and potentially subject to Conservation Compliance.[3] In 1995, the first year conservation systems were to be fully applied and maintained, conservation plans had been approved for 139 million HEL acres (USDA, NRCS, 1996b). Of those acres with approved plans, 91 million were cultivated non-CRP HEL subject to compliance, while another 16 million acres were either not under cultivation in 1995 or were subsequently determined not to be HEL (USDA, NRCS, 1996a).[4] These acreage estimates can fluctuate with year-to-year changes in cultivated acreage. An estimated 30 million acres were enrolled in CRP and considered in compliance (USDA, FSA, 1997).[5] A remaining 2 million acres had not had compliance determinations. NRCS determined that approved conservation practices and systems were actively applied on over 86 million (95 percent) of the 91 million acres of non-CRP HEL subject to compliance (USDA, NRCS, 1996a). The proportion of HEL units determined as subject to compliance and

[3] This includes some non-HEL soils that are in fields that are predominantly HEL.

[4] Land not currently in cultivation could be planted in cover crops or be in other conserving uses.

[5] Acreage of HEL enrollled in CRP could not be estimated directly from the NRCS 1995 Status Review and had to be derived from other sources.

Table 6.4.1—Conservation compliance status, 1995

Region	Designated HEL in cultivated cropland subject to compliance[1]	Actively applying approved plan	Actively applying plan with variances	Not actively applying plan (violations)
	Acres		*Percent of operating units*[2]	
Northeast	2,457,859	93.9	2.8	2.4
Appalachian	4,719,538	96.5	2.4	1.1
Southeast	1,021,934	98.3	0.7	0.5
Lake States	4,004,279	95.7	2.3	1.5
Corn Belt	18,662,889	90.3	7.6	2.0
Delta States	758,134	98.1	0.0	0.6
Northern Plains	23,683,540	94.3	4.2	1.5
Southern Plains	11,934,394	97.8	1.5	0.7
Mountain States	19,417,899	98.3	0.7	0.5
Pacific	4,306,341	92.4	5.5	2.0
Total/average	90,987,369	94.6	3.8	1.4

[1] Acreage total excludes HEL in the CRP.
[2] The percentage of acres in each compliance status determination is not known because the determination was made on an operating unit basis. However, the percentage of units in each status designation is an indicator of the relative acreage. The rows may not sum to 100 percent due to rounding, and because HEL cropland falling in "other" (includes, for example, wetlands on HEL or acres not required to apply plans) has been omitted.
Source: USDA, ERS, based on NRCS 1995 Status Review of Conservation Compliance.

not actively applying an approved conservation plan declined from 2.9 to 1.4 percent between 1994 and 1995 (USDA, 1994b and 1996a).

Only a small proportion of HEL cropland is not in compliance, although variances can be important in some regions. Based on survey estimates, about 1.3 million acres of HEL were estimated to be in violation (not actively applying an approved plan) in 1995. This represents just 1.4 percent of the 91 million acres of HEL cropland subject to compliance (USDA, 1996a). The Northeast had the highest percentage of units estimated to be in violation, while the Southeast had the lowest percentage (table 6.4.1). In 1995, the Corn Belt and Pacific regions had the highest percentages of units receiving climatic and hardship variances. Variances are offered to producers when climatic conditions prevent implementation of the full conservation plan, as when a drought prevents the establishment of a cover crop. Hardship variances are offered when circumstances such as family illness or crop failure prevent a farm from implementing the conservation plan. Because drought or floods can be widespread, variances can be important, not only for individual farmers, but also for broader production regions. The Northern and Southern Plains, Mountain States, and Corn Belt accounted for 80 percent of HEL acreage subject to conservation compliance in 1995 (table 6.4.1). In all regions, more than 90 percent of operating units with HEL subject to compliance were actively applying and maintaining an approved conservation system.

Since 1986, violations of the HEL conservation subtitle have resulted in $13.6 million in denied benefits on over 200,000 acres of cropland (table

Table 6.4.2—Benefits denied under the conservation compliance and sodbuster programs, 1986-95

Year	Producers found in violation	Land in violation	Value of benefits denied	Producers with all benefits denied
	Number	*Acres*	*Dollars*	*Number*
1986	2	10	10,834	2
1987	66	3,289	224,328	66
1988	174	3,745	530,974	174
1989	83	2,957	238,239	83
1990	342	60,295	1,555,209	342
1991	584	42,675	2,928,188	nd
1992	693	38,503	1,803,250	nd
1993	859	36,252	3,232,378	341
1994[1]	632	25,933	2,087,251	261
1995[2]	118	3,266	955,215	40
Total	3,553	216,925	13,565,866	1,309[3]

nd = no data available. [1] Preliminary. [2] As of December 11, 1995. [3] Number is incomplete because no information is available for 1991 and 1992.
Source: USDA, ERS, based on USDA, FSA, 1996.

Table 6.4.3—Conservation management systems and technical practices being applied on cultivated HEL subject to compliance (excluding CRP), 1995

Item	Acreage	Percent of cultivated HEL[1]
Management systems		
Conservation cropping sequence/crop residue use	27,443,973	30.2
Conservation cropping sequence/conservation tillage	9,081,148	10.0
Conservation cropping sequence only	6,249,209	6.9
Crop residue use only	4,041,388	4.4
Conservation cropping sequence/conservation tillage/grassed waterways	2,027,771	2.2
Conservation cropping sequence/conservation tillage/contour farming/grassed waterways/terrace	1,958,476	2.2
Conservation cropping sequence/contour farming/crop residue use/terrace	1,896,080	2.1
Conservation cropping sequence/crop residue use/wind stripcropping	1,768,605	1.9
Conservation cropping sequence/contour farming/crop residue use/grassed waterways/terrace	1,665,697	1.8
Conservation cropping sequence/conservation tillage/crop residue use	1,602,604	1.8
Total, 10 most frequently used systems	57,734,951	63.5
Technical practices[2]		
Conservation cropping sequence	75,632,767	83.1
Crop residue use[3]	48,294,496	53.1
Conservation tillage[3]	28,477,584	31.3
Contour farming	18,046,999	19.8
Terrace	12,868,684	14.1
Grassed waterway	10,842,932	11.9
Field border	4,442,198	4.9
Wind stripcropping	3,508,340	3.9
Cover and green manure	3,169,983	3.5
Surface roughing	3,018,871	3.3
Grasses and legumes in rotation	2,424,281	2.7
Stripcropping-contour	1,699,477	1.9
Critical area planting	1,545,287	1.7
Pasture and hay land management	1,126,426	1.2

[1] Based on 91 million acres of cultivated HEL subject to compliance.
[2] Because many conservation systems include multiple technical practices, percentages will sum to more than 100.
[3] Conservation tillage and residue mangement are often combined and reported as a single practice, conservation tillage.
Source: USDA, ERS, compiled from NRCS data, 1996.

6.4.2) (USDA, FSA 1996). Violations prior to 1990 were Sodbuster violations that occurred when HEL was brought into production without an approved conservation management plan, causing farmers to be ineligible for USDA benefits. After 1990, all farmers participating in USDA programs were to have approved conservation plans on HEL cropland. Persons without approved conservation plans or who were not implementing them on schedule could be found in violation of the conservation compliance provision.

Conservation Plans and Systems

Conservation plans specify economically viable conservation systems which substantially reduce erosion. Conservation systems are composed of one or more conservation practices. The 1995 status review provides the first assessment of fully implemented conservation systems under Conservation Compliance. Although the 1995 status review found over 4,000 different conservation systems (combinations of practices) applied nationwide, four conservation systems involving conservation cropping sequences, crop residue use, or a combination of these practices with conservation

Table 6.4.4—Technical practices included in conservation plans in Iowa, North Carolina, North Dakota, and Oklahoma, 1995

Technical practice	Iowa	North Carolina	North Dakota	Oklahoma
		Percent of conservation plans[1]		
Conservation crop rotation	87.1	82.0	99.0	9.9
Conservation tillage	79.2	30.6	0.4	3.5
Residue management	.7	50.5	98.4	92.3
Contour farming	44.4	24.3	--	5.4
Strip cropping field border	32.3	15.0	--	--
Strip cropping - contour	2.3	0.0	--	--
Strip cropping field	--	5.0	--	--
Strip cropping wind	--	--	0.6	0.3
Grassed waterway - retired[2]	24.9	21.9	0.7	8.2
Grasses & legumes in rotation	1.0	7.2	0.0	--
Cover and green manure crop	0.0	5.1	1.5	.3
Conservation cover - retired[2]	0.0	13.6	3.0	0.5
Critical area planting - retired[2]	0.8	4.3	0.1	0.6
Terrace	13.4	1.2	0.0	0.2
Pasture & hay land management	13.7	5.9	0.2	22.5
Pasture & hay land planting	1.3	6.3	0.4	0.3

-- indicates less than 0.1 percent.
[1] Because many conservation systems include multiple practices, percentages will sum to more than 100.
[2] Retired indicates land taken out of production.
Source: USDA, ERS, based on NRCS 1995 Status Review.

tillage covered half of HEL cropland (table 6.4.3). Conservation cropping sequences were included in the conservation systems applied to 83 percent of non-CRP HEL, and either conservation tillage or crop residue use was applied to 84 percent. Terraces, which require a significant capital investment, were used in 14 percent of conservation systems. Practices taking land out of crop production—such as grassed waterways, field borders, and critical areas plantings—are included in 12, 5, and 2 percent of the plans.

Adoption of particular conservation systems varies with climate, topography, soils, predominant crops, and pre-existing production practices. A system or practice acceptable in one location may not be feasible in another. The effectiveness of a system in controlling erosion depends on several factors, including the frequency, timing, or severity of wind and precipitation; the exposure of land forms to weather; the ability of exposed soil to withstand erosive forces; the plant material available to shelter soils; and the propensity of production practices to reduce or extenuate erosive forces.

A comparison of Iowa, North Carolina, North Dakota, and Oklahoma illustrates how local environmental conditions affect farmers' adoption of particular conservation systems. In the relatively homogeneous Northern Plains, there are few economically viable alternatives to a wheat/fallow rotation. Thus, in North Dakota, the conservation crop sequence/crop residue management system was part of nearly all conservation systems on cropped HEL (table 6.4.4; USDA, NRCS, 1996a). Similarly, in the Southern Plains, wheat is the predominant crop, with few economically viable alternatives. In Oklahoma, most conservation systems consist of a single technical practice—crop residue management. Both the number of feasible conservation systems and the number of systems required to control erosion are greater in areas with greater climatic and geographic variability. Iowa produces predominantly corn and soybeans, and has a higher average rainfall and a more varied topography than North Dakota and

Table 6.4.5—Land use and erosion changes on cultivated HEL and non-HEL, 1982-92

Region	Land use change				Erosion change[2]		
	Small grains	Row crops	CRP land[1]	Other ag.	Wind	Water	Total
HEL cropland[3]	*1,000 acres*				*Tons/acre/year*		
Northeast	-20.7	-391.1	95.7	-212.7	-2.01	0.00	-2.01
Appalachian	-530.1	-1,782.6	784.8	86.7	-5.30	-0.06	-5.36
Southeast	-192.3	-793.3	501.3	112.2	-5.82	0.00	-5.82
Lake States	-372.6	20.8	893.2	-244.3	-4.05	-0.71	-4.76
Corn Belt	-1,693.4	-1,818.5	2,996.9	-110.6	-8.53	-0.57	-9.11
Delta States	-86.7	-1,186.4	537.0	-135.4	-8.04	0.00	-8.04
Northern Plains	-2,081.6	-1,760.7	4,615.5	-890.3	-1.60	-2.61	-4.21
Southern Plains	-380.2	-1,939.3	3,265.4	-407.1	-0.49	-9.91	-10.00
Mountain States	-1,990.5	-1,084.5	5,225.3	-433.5	-0.75	-2.82	-3.57
Pacific	-527.1	-78.5	881.1	238.2	-4.20	-0.74	-4.94
Total HEL	-7,898.6	-10829.5	19,796.2	-2,001.7	-3.18	-2.69	-5.87
Non-HEL cropland							
Northeast	-94.1	-764.1	109.3	438.6	0.57	-0.00	0.57
Appalachian	-33.6	-1,454.5	291.4	726.7	0.39	0.01	0.40
Southeast	-676.3	-2,879.2	1,020.8	513.9	-0.31	0.00	-0.31
Lake States	-2,421.7	167.0	1,837.1	79.9	-0.15	0.05	-0.06
Corn Belt	-1,731.3	-183.2	2,139.0	1,017.0	-0.52	-0.52	-1.04
Delta States	156.3	-2,586.1	616.7	1,339.1	-0.45	0.00	-0.45
Northern Plains	-4,854.5	3,791.9	4,268.9	-601.5	-0.18	-1.60	-1.77
Southern Plains	-3,399.5	-1,733.8	1,870.7	314.5	0.06	-1.59	-1.53
Mountain States	-1,923.3	142.0	1,252.0	-505.0	-0.18	0.49	0.31
Pacific	-1,955.1	-520.5	837.9	693.7	-0.15	0.20	0.05
Total Non HEL	-16,008.1	-5,967.7	14,243.8	4,016.9	-0.20	-0.61	-0.82

[1] CRP in 1992, but cropland in 1982.
[2] Average erosion change on cultivated and CRP lands in 1992.
[3] HEL cropland refers to NRI points with an EI of 8 or greater.
Source: USDA, ERS, based on Kellogg and Wallace, 1995.

Oklahoma. Thus, in Iowa, a larger number of conservation systems are used, most frequently conservation cropping sequences and conservation tillage. North Carolina has a variable topography with diverse soils and precipitation patterns, and produces sizable quantities of wheat, corn, soybeans, cotton, sorghum, and tobacco. Here, the conservation systems are even more varied.

Erosion Reduction on HEL

Evidence from the National Resources Inventory (NRI) suggests that focusing conservation efforts on HEL was effective in reducing soil erosion on HEL. Between 1982 and 1992, estimated rates of soil erosion on U.S. cropland declined an average of 2.8 tons per acre per year (tay) (USDA, 1994).[6] Estimated erosion on cropped HEL declined at an even higher rate, 5.9 tay on average (USDA, 1994a, table 6.4.5). Since 1985, Conservation Compliance, Conservation Reserve, and Sodbuster all worked to reduce soil erosion on HEL directly. Other changes in commodity programs affected soil erosion indirectly by altering producer returns, changing

[6] The rate of soil erosion is estimated using the Universal Soil Loss Equation and the Wind Erosion Equation. Both consider factors such as the erodibility of the soil material, the slope and slope length, climatic conditions, land use, vegetative cover, and conservation practices. The factors that producers can reasonably change to alter soil erosion are land use, vegetative cover, and conservation practices.

relative profitability between commodities, and changing land use and production practices.

With more complete implementation of conservation systems since 1992, the erosion on cultivated HEL has declined further. In 1995, the implemented conservation systems reduced average soil erosion to less than the soil tolerance level (T) on 44 million acres, nearly half of HEL cropland subject to compliance (USDA, NRCS, 1996a). On most of the balance, average erosion was less than 2T. In 1995, erosion on HEL averaged 9.2 tay less than it did prior to installing and maintaining approved conservation systems. Not all of this reduction can be attributed to Conservation Compliance. Changes in market and program prices and technological innovations also affect the adoption of conservation systems. Some conservation practices now in place on HEL would have been applied even without the program and some were in place before the program.

Costs and Benefits of Conservation Compliance

While fully implemented conservation plans provide erosion control benefits, reducing soil erosion has a cost shared by farmers, consumers, and taxpayers. These costs and benefits can vary widely across individuals and regions. Conservation compliance requirements can increase production costs for farmers by idling or retiring cropland, substituting more expensive production practices, or requiring the purchase of new equipment. Consumers can be affected by changing market prices, as competitive commodity markets transmit changes in the cost of production. Other costs include the administrative costs of the compliance programs, which are borne by taxpayers (see box, "Summary of Reports Assessing Conservation Compliance," p. 309).

Benefits

Erosion control provides both onsite productivity benefits to farmers and off-site benefits from lower environmental damages. Reducing soil erosion helps maintain soil quality and land productivity. Erosion control reduces the water pollution associated with sediment, attached nutrients, and pesticides deposited into rivers, lakes, and streams. It also lowers maintenance costs for irrigation facilities and waterways and increases the service life for dams by reducing the amount of storage area lost to sedimentation. Reducing wind erosion lowers costs of cleaning wind-blown soil from machinery and household items.

Water and air quality benefits of erosion control are uncertain because of the difficulties in predicting weather patterns and other physical processes such as runoff and leaching. However, Ribaudo and Young (1989) estimated the national off-site benefits from controlling soil erosion to be 56 cents per ton, or $9 billion dollars per year. This includes commercial and recreational uses, water storage, and reduced flood damage, but ignores health and aesthetic benefits, as well as any interactions between changes in soil erosion and chemical leaching effects. Piper and Lee (1989) estimated the benefits of reduced damage from wind erosion at $0.30-$1.96 per ton abated.

Costs

The costs of Conservation Compliance in a given region or to individual producers within a region depend on several factors. These include the distribution of HEL cropland, the resource attributes of operations, and the production alternatives available to producers. In some cases, implementation of a Conservation Compliance plan entails little or no additional production costs. For example, conservation tillage and residue management systems reduce fuel, labor, and/or machinery costs (Bull, 1996; Fox, et al., 1991; Miller, 1996). These systems are being adopted not only on HEL subject to compliance, but on other lands as well. In other cases, compliance requires farmers to take acreage out of production or to make significant capital investments. As shown earlier, Iowa and North Carolina have a much higher percentage of plans with higher cost practices—such as terraces, critical area plantings, grassed waterways, border strips, and filter strips—than do North Dakota and Oklahoma (table 6.5.4). Even within States, there can be considerable variation in the reliance on higher cost practices.

The net costs of individual cropping practices may also vary across different physical settings. Some practices will entail little or no cost in some areas, but be costly in others. For example, conservation cropping rotations can entail only minor changes (or no changes) from pre-existing crop rotations, such as reduced grazing of winter wheat to maintain sufficient residue cover. In other cases, conservation rotations may require farmers to establish non-revenue producing winter cover crops or to add a year to a rotation, reducing producer returns. These more costly practices are often required for crops that leave little crop residue or that require substantial soil disturbance such as sugar beets, potatoes, or peanuts. Terracing is another practice with net returns sensitive

Table 6.4.6—Benefits and costs of conservation compliance, regional estimates[1]

Region	Per-acre benefits from--			Per-acre costs to--		Net economic benefits	Benfit/cost ratio
	Water quality	Air quality	Productivity	Producers	Federal Government		
	Annual 1993 dollars per acre						
Northeast	35.63	0	0.16	3.57	3.43	28.80	5.12
Lake States	21.99	0	0.12	0.32	3.43	18.37	5.90
Corn Belt	15.61	0	0.25	8.90	3.43	3.53	1.29
Northern Plains	3.47	3.00	0.19	3.35	3.43	-0.11	0.98
Appalachia	23.58	0	0.24	3.51	3.43	16.89	3.43
Southeast	25.63	0	0.12	8.18	3.43	14.15	2.22
Delta	35.50	0	0.12	1.97	3.43	30.22	6.60
Southern Plains	5.26	4.63	0.33	2.34	3.43	4.45	1.77
Mountain	5.10	4.01	0.15	0.20	3.43	5.63	2.55
Pacific	31.83	1.09	0.14	2.23	3.43	27.40	5.85
United States	13.81	1.93	0.21	3.78	3.43	8.74	2.21

[1] For procedures used, see box "Measuring the Benefits and Costs of Conservation Compliance." Onsite benefits based on USDA (1986) and SCS March 1994 status review. Offsite benefits are based on Ribaudo (1989), Huszar (1989), and SCS status review. Costs are based on Barbarika and Dicks (1988), SCS status review, and SCS staff-year projection. U.S. figures are weighted means of regional numbers, based on HEL acreage by region.

Source: USDA, ERS, based on Canning, 1994.

to local conditions. The capital expenditure, maintenance cost, and opportunity cost of land taken out of production associated with installing terraces generally exceeds the discounted benefits. However, in drier environments, the increased yield from moisture conservation can result in the discounted benefits exceeding costs (Clark, et al., 1985).

In North Dakota, Iowa, and Oklahoma, pasture and hay land management includes periodic cropping of pasture land to improve ground cover, control weeds and address problems on root-bound lands. These conservation measures, which provide more productive pasture and hay land, tend to increase net farm revenues. However, in some States, pasture and hay land management reflects a shift from cropping to a less intensive and less profitable use.

Conservation Compliance also has administrative costs, ideally measured as the difference between costs with and without the program. NRCS estimated that 6,000 staff-years would be required to administer the Conservation Compliance program in 1994, with staff-year requirements declining by one-half in 1995, and further in later years. Two important figures are absent from these data: (1) how the conservation provision influenced the total size of NRCS staff years, and (2) whether any services previously provided by existing staff were phased out due to compliance duties (Canning, 1994).

Comparing Costs and Benefits

Canning (1994) estimated the national benefits of Conservation Compliance (table 6.4.6) to be $15.95 per acre, with water quality improvements the largest source of benefits ($13.81 per acre). The estimated national cost was $7.21 per acre, shared fairly evenly by producers and government. Costs borne by farmers/landowners are offset by improvements in long-term soil productivity. Taxpayers pay the administrative costs of the program, including cost-share assistance, in return for the public benefits from improved air and water quality. These estimates lead to a benefit/cost ratio of 2.2, indicating that, on average, over two dollars of benefits are being obtained for each dollar of cost.

Benefit/cost ratios range from 0.98 in the Northern Plains States, the region with the greatest amount of HEL, to 6.60 in the Delta States (table 6.4.6). Four regions—the Northeastern, Lake States, Delta States, and Pacific—had benefits exceeding costs by a ratio of more than 5 to 1.[7] The Delta States region was the only region with both a large reduction (8 tons per acre per year) in the estimated rate of soil erosion and a high benefit/cost ratio. The Corn Belt and the

[7] The Corn Belt includes Illinois, Indiana, Iowa, Missouri, and Ohio; the Delta States includes Arkansas, Louisiana, and Mississippi; and the Southern Plains is composed of Oklahoma and Texas.

Measuring the Benefits and Costs of Conservation Compliance

The benefit and cost estimates presented in table 6.3.3 are based on a combination of sources. A March 1994 status review provides detailed information related to the goals and accomplishments of the conservation compliance provision. This information is translated into monetary estimates of annual benefits and costs using studies that estimate the economic impacts of soil erosion to households, firms, and municipalities.

Water Quality

Several studies have looked at the relationship between water quality and soil erosion from farmland. Ribaudo (1989) estimated the value of total annual damage caused by soil erosion from all sources to the quality of water used by households, industry, and municipalities in the 10 farm production regions. The damages from cropland erosion per ton can be estimated by multiplying Ribaudo's regional damage estimate by cropland's percentage of total sediment delivery, and dividing the result by the region's total annual erosion from cropland. Multiplying the water quality damages per ton of soil erosion for each region times the erosion reduced by compliance in that region provides an estimate of compliance's water quality benefits in that region.

Air Quality

Air quality is affected by wind-blown soil, which accounts for much of the erosion west of the Mississippi River. Like water-based erosion, a damage function for wind erosion depends on the use value of the damaged good and on the total volume of wind erosion. Huszar (1989) uses contingent valuation techniques to determine the annual damage per household per ton of wind-blown dust in New Mexico. As with water-based soil erosion, marginal wind-blown soil abatement benefits are smaller in sparsely populated areas, and where the total volume of wind erosion is large relative to the reduction achieved by compliance. Huszar's damage function is applied to estimate county-level impacts of a reduction in wind erosion from conservation compliance in all regions west of the Mississippi River. These estimates are then aggregated to farm production regions. In eastern regions, wind erosion damage is not estimated, although it is a problem in some areas. The estimates include only household-related damage. Inclusion of dust damage to firms, health, and recreation would increase the damage values.

Productivity

Onfarm benefits of soil conservation have been estimated by USDA (1986) as the net current value of future productivity gains to soil per ton of erosion abatement. Weighting the USDA value per ton of soil conservation for each soil group by the percentage of acreage in each soil group for each county with significant HEL acreage provides estimates of the onfarm net present value per ton of soil conservation. Multiplying this value by soil savings from conservation compliance and annualizing these benefits (based on a 4-percent discount rate) gives estimates of annual productivity gains.

Producer and Government Costs

Conservation compliance costs of producers are estimated at the field level. For HEL fields that need only conservation tillage, crop rotation, or other residue management (no structures), compliance cost is assumed to be zero. Barbarika and Dicks (1989) assumed a no-cost transition to conservation tillage when this was all that was required for full compliance. In a national survey reported by Esseks and Kraft (1993), 1 in 5 producers subject to compliance expected to incur costs, and under 1 in 20 expected significant costs. Where structures are prescribed by SCS, one of two equations (depending on whether or not conservation tillage is already applied to the field), estimated by Barbarika and Dicks, is used to relate annual installation and maintenance costs per acre to the level of soil erosion and the size of the treated field. Since the Barbarika and Dicks equations include the value of SCS technical assistance, this value is deducted from annual costs to avoid double-counting government costs.

Government costs of carrying out compliance are based on the value of continuing staff time per acre. USDA's budgeted annual staff years devoted to compliance duties are projected to level off at just under 2,000 by 1996. To be consistent with Barbarika and Dicks, opportunity costs are set at $82 per staff hour ($62.50 per staff hour in 1985 dollars converted to 1993 dollars). Compliance acres are estimated at 100 million, 86 percent of total HEL acreage (Esseks and Kraft,1993), less 28 million acres enrolled in the CRP. The startup costs of compliance, such as the staff years devoted to HEL determinations and development of conservation plans, are not included since they would amount to very little on an annualized basis.

Southern Plains had comparable reductions but lower per-acre benefits and higher costs.

Changes in Commodity Programs Affect Incentives for Compliance

The Conservation Compliance Program requires farmers growing crops on HEL cropland to implement an approved soil conservation plan in order to participate in commodity programs. This requirement directly links incentives offered by commodity programs with soil conservation goals. Prior to the FSA of 1985, commodity programs provided farmers with incentives to bring land into production and encouraged cultivation of erosive crops (Reichelderfer, 1985). In some cases, land brought into production was vulnerable to soil erosion. Cultivating lands vulnerable to erosion need not in itself be a problem if farmers adopt appropriate soil conservation measures. However, in many cases farmers may not have had a private incentive to do so. Conservation Compliance attempts to use commodity programs benefits to encourage farmers to adopt soil conservation practices.

Linking program benefits to conservation efforts also means that the *size* of the commodity program benefits can affect farmers' incentives to adopt soil conservation practices. Conservation Compliance requirements do not apply to producers not participating in programs. Changes in program benefits and compliance costs can influence program participation and the effectiveness of the Conservation Compliance Program. Between 1986 and 1995, commodity corporation outlays to the seven major program crops have decreased from $18.6 billion to $4.1 billion. Over this period, program participation also declined. Large changes in benefits are more likely to affect farmer incentives to participate in programs where costly conservation systems are required. Farmers using conservation systems that are cost-saving or cost-neutral will be more likely to retain these systems even if benefits decrease.

Changes in the *design* of commodity programs can also affect farmer incentives to participate in programs and to meet Conservation Compliance requirements. The 1996 Farm Act replaces the previous target price-deficiency payment system with a system of fixed annual payments. Under the previous system, farmers received payments based on the difference between the market price and a pre-determined target price for a portion of their production. Deficiency payments would rise when prices were low, but decline in years when prices were high. Farmers' program payments and their incentives to participate in programs would decline in high-price years. Under the 1996 Farm Act, payments to producers do not automatically decline in years when commodity prices are relatively high, so higher prices are less likely to reduce incentives to meet Conservation Compliance. The 1996 Farm Act also expands planting flexibility, increasing the attractiveness of program participation. It allows producers to make more market-based planting decisions by eliminating Acreage Reduction Programs that required farmers to take acreage out of production in some years as a condition of receiving program payments. It also eliminated many planting restrictions for producers of grains and upland cotton.

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Glossary

Approved conservation system—A set of field-specific cropping and managerial soil conservation practices designed in cooperation with local NRCS agents to reduce soil erosion. Basic conservation systems, which pertained to Sodbuster lands until 1996 and may be applied to other HEL, reduce erosion to the soil tolerance level (see definition below). Alternative conservation systems provide a significant level of erosion reduction without excessive economic burden on producers for land subject to conservation compliance.

Applied conservation system—An approved conservation system that has been applied and is being maintained, based on standards contained in the NRCS field-office technical guide.

Conservation Compliance provision—Since 1985, the conservation provision requires all farmers producing on HEL who receive or request certain USDA benefits to have an approved conservation system applied on those lands. Violations may result in disqualification from USDA programs or reduction of benefits.

Conservation cropping sequence—A crop rotation (multi-year sequence of crops) designed to improve or maintain good physical, chemical, and biological conditions of the soil; help reduce soil erosion; improve water use efficiency and water quality; improve wildlife habitat; or break reproduction cycles of plant pests.

Erodibility index (EI)—The natural erosion potential of a soil divided by the soil's tolerance level.

Field—A contiguous tract of land under a single farm operation and isolated by permanent barriers, such as fences, waterways, or woodland.

Highly erodible land (HEL)—Designations made by NRCS field staff include cropland in fields that have at least one-third or 50 acres (whichever is less) of highly erodible soils. HEL soils were defined as those soils with an erodibility index (EI) greater or equal to eight. An EI of 8 indicates that without any cover or conservation practices, the soil will erode at a rate 8 times the soil tolerance level. HEL designations currently total 146 million acres. This number has changed over time as more producers apply for benefits and more determinations are made.

Soil tolerance level (T)—The rate of soil erosion that can continually occur without reducing that soil's productivity.

Tract or operating unit—All fields farmed by a single operator. The entire unit is subject to the penalties of noncompliance, provided any field in the unit is determined to be highly erodible and the operator of that field has not applied or maintained the approved conservation system before receiving certain USDA program benefits.

Variances—Variances are offered to producers when **climatic** conditions such as flood or drought prevent implementation of the full conservation plan. One example would be where a drought prevented the establishment of a cover crop. **Hardship** variances are offered when circumstances such as family illness or crop failure prevent a farm from implementing the conservation plan. Because drought or floods can be widespread, variances can be important for not only individual farmers but also production regions.

Violations/disqualifications—Determined by FSA on recommendations of NRCS field staff, based on the guidelines of the approved conservation system. Before January 1, 1995, they occurred when an HEL field failed to have a partially applied conservation system by specified interim deadlines. After January 1, 1995, they occur when an operator requests or receives certain USDA program benefits without fully applying or maintaining an approved conservation system on HEL. Operators can request the development of a new plan or may be granted a temporary variance.

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Summary of Reports Assessing Conservation Compliance

USDA Natural Resource Conservation Service Status Reviews

Each year, NRCS randomly selects 5 percent of all HEL tracts nationally to conduct a status review. Tracts receiving variances are visited each year, as are tracts referred to NRCS by other agencies or whistle blowers. For each review, an NRCS soil conservationist visits the fields to determine if a developed conservation system is being implemented properly. Erosion rates are estimated, then inadequacies are either reported to agencies administering Federal farm programs or farmers are granted a variance. NRCS provides farmers with specific instructions to bring the tract into compliance. Recent changes in the review process now target HEL that is enrolled in Federal farm programs, and thus subject to compliance. A detailed evaluation of program implementation in several States serves as an internal quality control of program administration.

U.S. General Accounting Office (1994)

GAO evaluated progress made by NRCS in implementing the Conservation Compliance and Swampbuster programs established in 1985. A previous GAO evaluation (1990) had indicated that NRCS needed to improve the quality of the farmers' conservation plans and improve enforcement activities. GAO examined whether recent NRCS reforms addressing the concerns of the previous evaluations had resulted in improvements in the management and effectiveness of Conservation Compliance and Swampbuster. GAO concluded that while there were positive aspects of the reforms, NRCS still needed to improve its enforcement activities through better managed status reviews and by establishing clearer authority of State and county offices over conservation plans and wetland identifications. GAO also recognized that effective enforcement of conservation plans and swampbuster requires a change in the "culture" of NRCS, a change that acknowledges NRCS' newer, more regulatory role rather than its traditional role of advising farmers.

USDA Office of Inspector General (1995)

The Office of Inspector General (OIG) audited the Conservation Compliance Provisions to determine if producers complied with conservation requirements on HEL and whether the provision was effective in reducing erosion. In the 30 counties audited, OIG found that management practices reduced erosion from 9.5 tons per acre per year (tay) to 5.1 tay. They found that the plans tended to overestimate the rate of erosion associated with the conservation plans. Forty-seven percent of the tracts audited had rates of erosion at or below their soil loss tolerance. OIG concluded that the tolerance level can be achieved on all HEL fields. Despite the low level of erosion, 21 percent of the sampled tracts were not in full compliance. Forty percent of the tracts received a total of $212,000 in government benefits while having an erosion rate in excess of the minimum acceptable level of 7.2 tay. To provide a more accurate picture of the state of erosion control, OIG recommended that NRCS: (1) develop better measures of progress in reducing erosion and include these in the status review; (2) develop measures to evaluate relationships between soil loss levels—before, planned, alternative conservation plans, current—and tolerance; (3) provide more specific guidance to state and local administrators on identifying and treating ephemeral gully erosion, and (4) provide a consistent set of factors in estimating wind and other erosion.

U.S. General Accounting Office (1995)

GAO evaluated three aspects of Conservation Compliance: implementation flexibility in USDA across different regions of the country, differences in farming practices and the associated cost of compliance, and benefits and drawbacks of the program. Flexibility has been increased by allowing state offices to develop alternative conservation practices to satisfy regional standards for erosion. GAO found that: (1) three quarters of farmer conservation plans specified residue management as the primary control technique; (2) use of reduced tillage increased 30 percent between 1990 and 1994, and (3) no comprehensive data were available on the effect of conservation plans on production costs. A review of studies on compliance costs found mixed results. Factors leading to these mixed results include crop characteristics, soil type, climate, and farming practices. Studies of conservation tillage methods have shown both higher and lower returns to farmers, depending upon yield effects and changes in pesticide applications. GAO identified reduced soil erosion and improved surface water quality as environmental benefits that were potentially offset by increased pesticide and herbicide applications.

6.5 Wetland Programs

Wetlands are important to the Nation's environment. Wetlands can store floodwater, trap nutrients and sediment, help recharge ground water, provide habitat for fish and wildlife, and buffer shorelines from wave damage. Wetlands can also provide outdoor recreation, produce timber, provide grazing for livestock, and support educational and scientific activities. Despite these public values, conserving land as wetland forecloses more intensive economic uses for landowners. Differences between public and private interests in wetlands provoke controversy over wetland programs and policies.

Contents

Wetland status involves both the extent or quantity of wetlands and the functions or quality of wetlands. Most policy interest has been focused on the extent of wetlands remaining and the rate of conversion from wetlands to other uses. However, as wetland loss rates decline, quality aspects are receiving increasing attention.

Wetland Status and Trends

Almost half of U.S. wetland acreage has been converted to other uses since colonial times. Current policy is attempting to balance wetland losses and wetland restoration, with the long-term goal of achieving a net gain in wetlands that would partly reverse the historic decline.

Wetland Extent

Estimated wetland extent in 1992 was almost 124 million acres in the contiguous 48 States (including an estimated 12 million acres of Federal wetlands), just over half of the wetlands present in 1780 (table 6.5.1). An additional 170 million acres of wetlands exist in Alaska and Hawaii, down slightly from colonial times. Absolute losses of wetlands since 1780 have been greatest in Texas, Florida, Minnesota, Illinois, Arkansas, North Carolina, and Louisiana, ranging from 5 to 10 million acres each. Nine States experienced a 70-percent or greater loss in wetland extent since 1780, and 9 more lost more than 50 percent of original wetlands. Net gains posted for some States may be due to underestimates of original wetlands, or represent real gains through incidental or intentional wetland creation or restoration associated with water impoundments and other projects. Remaining wetlands are concentrated in Florida, along the southeastern and gulf coasts, and in the northern Lake and Plain States (fig. 6.5.1).

The greatest loss of wetlands occurred between colonial times and the early decades of this century, with most occuring since 1885 (Pavelis, 1987). Average annual rates of wetland conversion have generally been falling since the first reliable scientific inventories were taken in the mid-1950's.[1] Between 1954 and 1974, the net rate of wetland conversion averaged 457,600 acres per year, with 81 percent of gross wetlands conversion to agricultural uses and 8 percent to urban (table 6.5.2, fig. 6.5.2). Between 1974 and 1983, net wetland conversion dropped to 290,200 acres per year; gross conversions to agricultural use accounted for 53 percent and urban

[1] Available data on wetland conversion are from three studies using different statistical sampling techniques on slightly different wetland universes.

Table 6.5.1—U.S. wetlands extent and losses, by States 1780's-1992[1]

State[1]	1780's extent[2]	1992 extent[3]	1780-92 losses[4]	
	Thousand acres			*%*
Texas	16,000	5,656	10,344	65
Florida	20,325	11,251	9,074	45
Minnesota	20,135	11,738	8,397	42
Illinois	8,212	1,361	6,851	83
Arkansas	9,849	3,140	6,708	68
North Carolina	11,090	5,259	5,830	53
Louisiana	16,195	11,195	5,000	31
Indiana	5,600	769	4,831	86
Mississippi	9,872	5,675	4,197	43
Ohio	5,000	937	4,063	81
Missouri	4,844	985	3,849	80
Alabama	7,568	3,737	3,830	51
Michigan	11,200	7,454	3,746	33
Wisconsin	9,800	6,546	3,254	33
California	5,000	1,901	3,099	62
Iowa	4,000	1,183	2,817	70
South Carolina	6,414	3,878	2,536	40
Oklahoma	2,843	497	2,345	83
Nebraska	2,910	1,206	1,705	59
Colorado	2,000	691	1,309	65
Tennessee	1,937	806	1,131	58
Kentucky	1,566	447	1,119	71
North Dakota	4,928	3,825	1,103	22
Wyoming	2,000	932	1,068	53
Maine	6,460	5,522	938	15
Oregon	2,262	1,430	832	37
New Jersey	1,500	700	800	53
Arizona	931	231	700	75
New Mexico	720	84	636	88
Maryland	1,650	1,028	622	38
South Dakota	2,735	2,144	591	22
Washington	1,350	1,012	338	25
Connecticut	670	361	309	46
Massachusetts	818	594	224	27
Delaware	480	263	217	45
Pennsylvania	1,127	948	179	16
Nevada	487	326	161	33
Virginia	1,849	1,727	122	7
West Virginia	134	99	35	26
Rhode Island	103	96	7	6
Idaho	877	926	(49)	(6)
Kansas	841	915	(74)	(9)
Georgia	6,843	6,956	(113)	(2)
Montana	1,147	1,363	(216)	(19)
New Hampshire	220	476	(256)	(116)
Vermont	341	710	(369)	(108)
Utah	802	1,247	(445)	(56)
New York	2,562	3,718	(1,156)	(45)
48-State total	221,130	123,945	97,184	44
Hawaii	59	52	7	12
Alaska	170,200	170,000	200	0
U.S. total	391,389	293,997	97,391	24

[1]Ranked in order of absolute loss. [2]Based on estimates by Dahl, 1990. [3]Based on 1992 National Resources Inventory estimates totaling 111.4 million wetland acres on nonfederal land in the 48 States, adjusted upward to include an estimated 12.5 million acres of wetlands in Federal ownership derived from the locations of U.S. Fish and Wildlife Service National Wetland Status and Trends Analysis samples. Estimates for Hawaii are 1992 NRI and estimated Federal wetlands. Alaskan estimate is for 1980 from Dahl, 1990. [4] Wetland gains in eight States may be due to low estimates of 1780's wetland extent or real wetland gains since 1780. Source: USDA, ERS estimates based on Dahl, 1990 and 1992 National Resources Inventory data (see footnotes).

What is a Wetland?

Since 1977, the Federal Government has used a three-part wetland definition involving soils, vegetation, and hydrology. According to the U.S. Army Corps of Engineers (ACE), wetlands are "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." While the definition of wetlands has not changed over time, the precise guidelines for deciding what land meets that definition, called delineation criteria, have been controversial because of conflicts between landowners who want to use and develop wetland areas and environmentalists who want to preserve them.

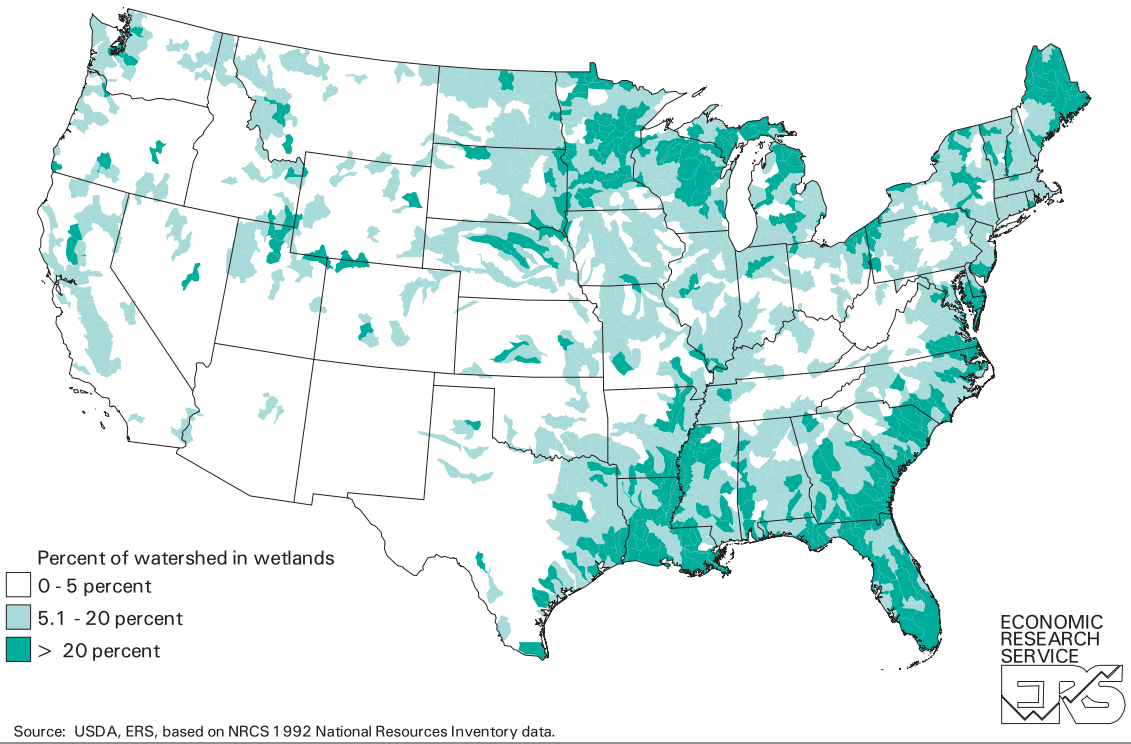
After interagency attempts to develop a manual for delineating wetlands in 1979, 1987, 1989, and 1991, a National Research Council committee was convened in 1994. Its report rejected the idea that all three indicators (soil, water, and vegetation) must be present and defended the use of one or two of the indicators to infer the presence of the third (NRC, 1995). It urged development of regional standards and protocols for delineation that recognize the diversity of wetlands and stressed the need for functional assessment in regulatory delineation.

Field tests of the latest manuals indicated that 30 to 80 percent of wetlands delineated in the 1989 manual would be excluded by the 1991 manual. Field evaluations in the fall of 1995 indicated that wetlands would be reduced 60 to 75 percent if proposed congressional revisions to wetland delineation are enacted.

uses for 3 percent (38 percent converted to other uses was cleared and drained, possibly intended for agricultural use). Between 1982 and 1992, the net rate of wetland conversion further dropped to 79,300 acres per year, with agriculture accounting for only 20 percent of gross wetland conversions and urban uses for 57 percent. Over half of all wetland losses between 1982 and 1992 were from forested wetlands or wetlands on forest land.

Conversion back to wetlands has increased from 1 acre for every 3 lost in 1954-74 to 1 acre for every 2 in 1982-92. Deepwater (permanently flooded lands) provided two-thirds of wetland gains in 1982-92 and former agricultural land provided 10 percent. In addition to abandonment, natural reversion, and

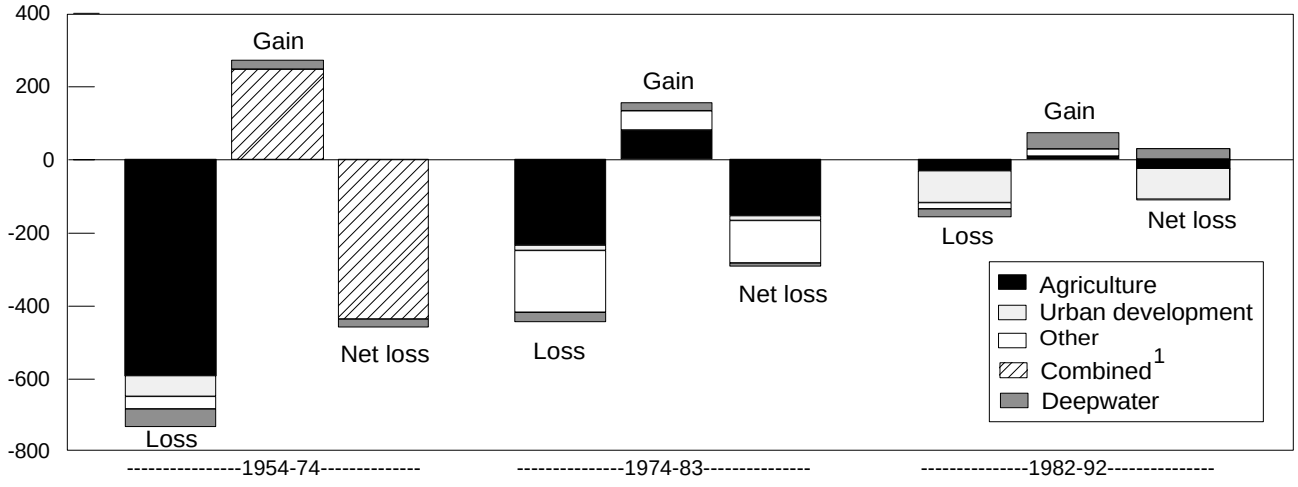
Figure 6.5.1--Distribution of wetlands on rural nonfederal land, 1992



Source: USDA, ERS, based on NRCS 1992 National Resources Inventory data.

Figure 6.5.2--Change in wetland acreage by use, 1954-1992

Thousand acres per year



[1] Combined agriculture, urban development, and other. Separate data not available.

Source: USDA, ERS, based on (for 1954-84) USDI, National Wetland Status and Trend Analysis; and (for 1982-92) NRCS, National Resources Inventory data.

Table 6.5.2—Average annual wetland conversion, contiguous States, 1954 to 1992

Item	USDI, Fish and Wildlife Service estimates[1] (Includes Federal lands)				USDA, NRCS estimates[2] (Excludes Federal and urban lands)	
	1954-74 change		1974-83 change		1982-92 change	
	1,000 acres/yr.	*Percent*	*1,000 acres/yr.*	*Percent*	*1,000 acres/yr.*	*Percent*
Wetlands converted to:						
Agriculture	592.8	81	234.8	53	30.9	20
Urban development	54.4	8	14.0	3	88.6	57
Other	35.3	5	168.1	38	16.4	10
Deepwater	47.6	6	29.0	6	20.2	13
Total	730.1	100	445.9	100	156.1	100
Converted to wetlands from:						
Agriculture			81.5	53	41.8	54
Urban development	247.8[3]	913	.4	0	1.5	2
Other			53.4	34	28.8	38
Deepwater	24.7	9	20.4	13	4.8	6
Total	272.5	100	155.7	100	76.9	100
Net change in wetlands[4]:						
Agriculture			153.3	53	-10.9	-14
Urban development	434.7[3]	953	13.6	5	87.1	110
Other			114.7	40	-12.4	-16
Deepwater	22.9	5	8.6	2	15.4	20
Total	457.6	100	290.2	100	79.3	100

na = not available. [1] U.S. Fish and Wildlife Service, National Wetland Status and Trends Analysis, mid-1950's to mid-1970's and mid-1970's to mid-1980's. Excludes Alaska and Hawaii. [2] Soil Conservation Service, USDA, National Resources Inventories, 1982 and 1992. Includes only nonfederal land. Excludes Alaska; includes Hawaii and Caribbean. Wetlands exclude deepwater habitats. [3] Includes agriculture, urban development, and other. Separate estimates not available. [4] Conversion of wetland to nonwetland uses, plus increases in wetlands due to restoration, abandonment, and flooding. Excludes change to or from Federal ownership. Source: USDA, ERS compilation of available data, see footnotes.

private activity, wetland gains resulted from restoration programs such as the joint ventures sponsored under the North American Waterfowl Management Plan, Fish and Wildlife Service's Partners for Wildlife program, mitigation required under Section 404 of the Clean Water Act, and the efforts of private groups such as Ducks Unlimited.

Wetland losses vary throughout the country. Gross wetland losses were greatest along the east coast, Great Lakes, and Gulf Atlantic States, especially Louisiana, Florida, and North Carolina (fig. 6.5.3). Losses were more moderate in the Pacific Northwest. Thus, while net losses of wetlands are greatly reduced, certain areas of the country and certain wetland types are still experiencing significant losses.

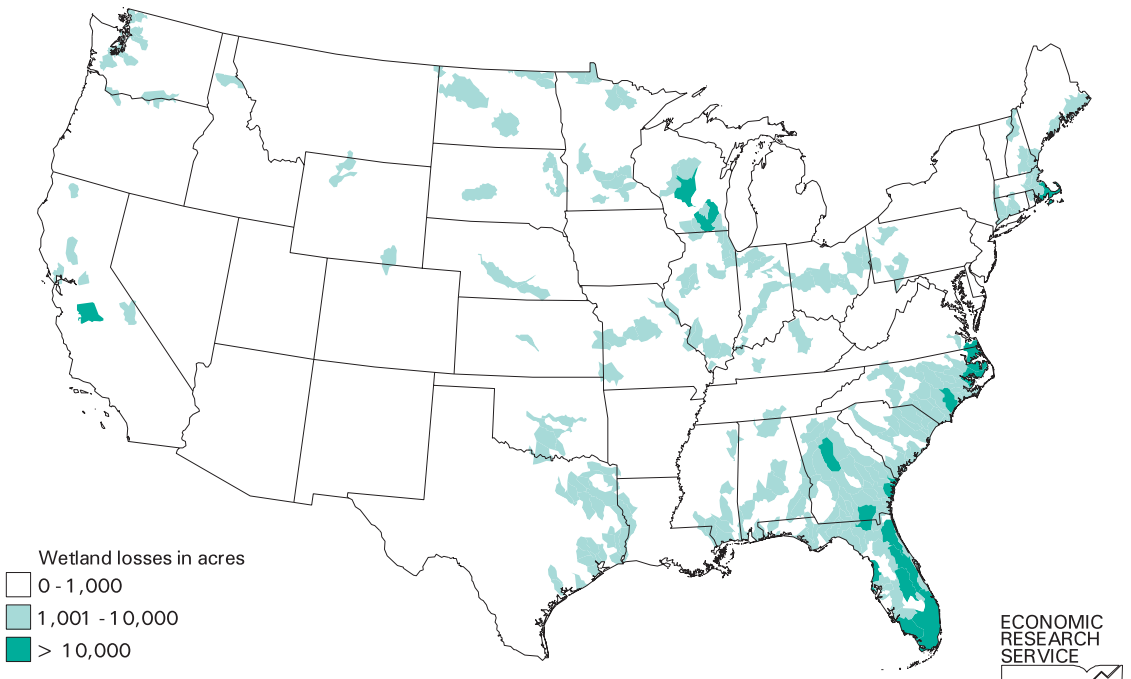
Wetland Quality

With wetland losses stemmed, wetland quality is now receiving greater attention. Wetland quality or function is determined by hydrologic functions (such as groundwater recharge, shoreline stabilization, flood peak reduction, tidal flows, and sediment accretion), nutrient supply functions (such as organic matter, nutrient concentrations, and toxic metal concentrations), plant community characteristics and dynamics (dominant and sensitive species), and faunal community characteristics (arthropods, fish, aquatic invertebrates, birds, and mammals) relative to optimal levels in a fully functioning wetland of each type (NRC, 1992).

Methods have been developed to analyze wetland function, but they have not been systematically employed to indicate trends in wetland quality (Brinson, 1996; Adamus and Stockwell, 1983). However, changes in four factors—soil erosion, irrigation, forest cover, and urbanization—have potentially affected wetland quality and serve as indicators. In 1982-92, net reductions in erosion and irrigation in wetland watersheds probably had positive effects on wetland quality, while deforestation and urbanization likely had negative effects (table 6.5.3).[2]

[2] Gross changes at the watershed level have not been validated as indicators of actual change in wetland quality and cannot reflect subtleties of landscape position and hydrology that would increase or mitigate wetland degradation.

Figure 6.5.3--Gross wetland losses, 1982-92



Source: USDA, ERS, based on NRCS 1992 National Resources Inventory data.

Sediment from soil erosion can clog wetland vegetation and impair water holding capacity. In 1982-92, decreases in all sources of water-caused erosion were widespread, occurring in 63 percent of the 677 wetland watersheds (watersheds with at least 5 percent of area in wetlands). Watersheds with erosion decreases contained 61 million wetland acres in 1992, while those with erosion increases contained 14.4 million wetland acres. Land retired from production in the Conservation Reserve Program—along with widespread changes in agricultural production practices caused by less intensive rotations, adoption of conservation tillage, and implementation of conservation compliance provisions in the 1985 Food Security Act—accounted for the erosion reductions.

Increases in irrigation can degrade wetlands where diversions from natural watercourses rob wetlands and other instream uses of water or where groundwater pumping lowers water tables and dries out wetlands. Similarly, decreases in irrigated area or in diverted water could improve wetlands. More wetland watersheds experienced net decreases in irrigated acreage between 1982 and 1992 than had net increases, but the majority had no change. Some 23 million acres of wetlands occurred in watersheds that had decreases in irrigated acres, and 15.8 million acres of wetlands were in watersheds where irrigated acreage increased. Watersheds with increases in irrigated acres are largely in humid areas where irrigation supplements natural precipitation. Supplemental irrigation may cause short-term stress on affected wetlands, but long-term damage is less likely.

Loss of tree cover, both from permanent land-use change and from normal harvesting of mature tree crops, can stress wetlands. Tree canopy protects watersheds from runoff and erosion and shades watercourses, lowering water temperatures for sensitive aquatic species. While some areas were planted to trees in 1982-92, development of tree canopy in a decade is usually insufficient to replace loss of mature tree cover. Nine out of 10 wetland watersheds lost forested acres between 1982 and 1992. The loss of tree cover reflects both purposeful harvest and incidental clearing of trees associated with changes such as urban and agricultural development. Forest harvest is likely the major cause of deforestation in the Southeast, northern New England, Minnesota and Wisconsin, and the Pacific. Tree clearing for urban development is likely a major

Table 6.5.3—Indicators of potential change in wetland quality, contiguous States, 1982-92

Indicator	Wetland watersheds[1]		Wetland area		Change in			
					Erosion	Irrigated area	Forest cover	Urbanization
	Number	*Percent*	*1,000 acres*	*Percent*	*Million tons*	*Million acres*		
Water erosion								
Increased erosion may have degraded wetlands	88	13	14.4	15	3.8	0.1	-1.0	-1.0
Decreased erosion may have improved wetlands	429	63	61.0	64	-98.0	0.3	-3.1	-4.9
No change	160	24	20.1	21	0.0	0.1	-1.2	-1.1
Irrigated area								
Increased irrigation may have degraded wetlands	93	14	15.8	17	-17.6	1.3	-1.0	-1.4
Decreased irrigation may have improved wetlands	149	22	23.0	24	-21.4	-0.8	-1.3	-2.4
No change	435	64	56.7	59	-55.2	0.0	-2.9	-3.1
Forest cover								
Decreased cover may have degraded wetlands	587	87	87.1	91	-86.9	0.5	-5.3	-6.7
No change	90	13	8.4	9	-7.3	0.0	0.0	-0.3
Urbanization								
Increased urban area may have degraded wetlands	647	96	92.3	97	-92.8	0.4	-5.2	-7.0
No change	30	4	3.2	3	-1.4	0.0	0.0	0.0
Summary of the four indicators								
All indicate degraded wetland quality	19	3	3.6	4	0.6	0.2	-0.3	-0.4
Three indicate degraded, one no change	187	8	25.0	26	2.1	0.2	-1.5	-1.2
Three indicate degraded, one improved quality	300	44	42.8	45	-68.8	0.7	-2.5	-3.3
All indicators made no change	9	1	1.0	1	0.0	0.0	0.0	0.0
Two indicate degraded, two indicate improved	142	21	21.1	22	-25.5	-0.6	-0.9	-2.0
Three indicate improved, one degraded quality	18	3	1.8	2	-2.5	-0.1	0.0	-0.1
All indicate improved wetland quality	2	0	0.1	0	-0.1	0.0	0.0	0.0
Total wetland watersheds	677	100	95.5	100	-94.1	0.5	-5.3	-7.0

[1] Watersheds with 5 percent or more of total area in wetlands.

Source: USDA, ERS, based on 1992 National Resources Inventory data.

cause in southern New England, the mid-Atlantic, and Florida.

Urban development, measured by the change in urban land area between 1982 and 1992, can stress wetlands because of increased runoff from paved areas, toxic runoff from industrial pollutants and chemicals and oils deposited on roadways, and from trash and garbage dumped in wetland areas. Nearly all wetland watersheds (96 percent) had urban land increases, adding 7 million acres of developed land over the decade. Urbanization in wetland watersheds represented 48 percent of total U.S. urbanization. More extensive suburban development patterns may have less impact on wetlands than intensive development, particularly where zoning and floodplain management avoid loss of wetlands and riparian areas.

The four indicators together provide insight on the overall change in wetland quality from 1982 to 1992 (table 6.5.3). Mostly negative indicators suggest that many more watersheds declined in quality than improved. Watersheds with wetlands likely degrading in quality (all four indicators negative or unchanged) totaled 206, just over 30 percent of the 677 wetland watersheds. The majority of the remaining watersheds (300) had more negative than positive indicators, suggesting a possible decline in quality (though the net effects of the positive and negative factors are uncertain). In contrast, only 2 watersheds likely had improving wetland quality (all indicators positive or unchanged) and 142 possibly had improving quality (more positive than negative indicators).

Wetland Incentives and Programs

Landowners respond to a variety of economic and public policy factors that influence wetland conversion. The recent reduction in wetland losses is likely the cumulative effect of several important trends: (1) decline in the profitability of converting wetlands for agricultural production; (2) passage of the Swampbuster provisions in the 1985 and 1990 farm bills; (3) continued implementation of the Clean Water Act Section 404 program, as well as growth in State regulatory programs; (4) greater public interest and support for wetland protection and restoration; and (5) implementation of wetland restoration programs at the Federal, State, and local level.

Economic Factors

Economic factors have, over time, both encouraged and discouraged wetland conversion. Between 1954 and 1974, relatively stable net farm incomes and new drainage technology contributed to wetland conversion for agricultural uses, averaging 592,800 acres per year. Cropland acreage increased in Florida (21.9 percent), Arkansas (16.1 percent), North Dakota (8.7 percent), and Iowa (7.7 percent). The next period (1974-83) saw an overall decline in farm income, accompanied by price volatility caused by international market pressures. These economic conditions, along with wetland regulations, slowed conversion to 234,800 acres per year. In 1982-92, falling prices, lower farm incomes, high debt loads, and the Swampbuster provisions reduced agricultural wetland conversion to only 30,900 acres per year.

Government payments to farmers have influenced wetland conversion over time. In 1954-74, government payments increased the revenue received for the commodities produced on converted land, reduced risk by stabilizing prices and revenue, offered an incentive to increase crop acreage base, and required additional land for set-asides. In 1974-83, real direct government payments dropped to only 9 percent of net farm income and were almost zero when commodity prices spiked between 1974 and 1977. In 1982-93, government payments averaged 26 percent of net farm income, but program rules no longer allowed participants to expand their base acreage and payments were denied to producers who converted wetlands after 1985.

The economic cycle in the construction sector has also affected wetland conversions. In 1954-74, postwar stability and a sharp increase in construction activity in the early 1970's resulted in wetland conversion for urban purposes averaging 54,400 acres per year. In 1974-83, wetland conversion for developed uses fell to only 14,000 acres per year. Wetland regulation under Section 404, which began in 1972, probably affected the construction industry more than it did agriculture because of construction's greater visibility, its greater familiarity to EPA and U.S. Army Corps of Engineers (ACE) regulators, and its proximity to EPA and ACE offices in urban areas. In addition, recovery in housing construction occurred more in the West and Midwest, resulting in less wetland conversion for the necessary land because of the less frequent occurrence of wetlands in those regions.

In 1982-92, new housing starts sustained a renewed rate of wetland conversion for developed uses averaging 88,600 acres per year, primarily in the South. The increased wetland conversion occurred despite a perceived tightening of wetland regulation under Section 404 and in State programs since 1987.

Similar levels of economic activity in agriculture and construction do not produce similar wetland conversion from one time period to another (table 6.5.4). Wetland losses to agriculture dropped from 12.6 acres for each million dollars of net farm income in 1954-74 to 0.9 acres in 1982-92 (Heimlich and Melanson, 1995). Wetland losses dropped from 30.2 acres per 1,000 housing starts in 1954-74 to only 8 acres in 1974-83, then rebounded to 49.4 acres per 1,000 starts in 1982-92. In part, these observed differences in conversion rates can be explained by differences in the regional distribution of activity, in the type and size of housing constructed, and in expectations of future profits when a sector is contracting versus expanding. However, wetland

Table 6.5.4—Wetland loss rates per unit of economic activity, contiguous States, 1954-92

Period	Average annual economic activity		Gross wetland loss per unit of economic activity	
	Net farm income	New private housing starts	Loss per $ million of net farm income	Loss per 1,000 housing starts
	$ billion (1987)	*Million*	*Acres*	
1954-74	47.5	1.8	12.6	30.2
1974-83	37.2	1.8	6.4	7.8
1982-92	34.0	1.7	0.9	49.4

Source: USDA, ERS, based on Heimlich and Melanson, 1995.

Table 6.5.5—Swampbuster provision violations, 1987-93[1]

Year	Producers in violation	Land in violation	Benefits denied
	Number	*Acres*	*$ million*
1987	12	100	0.1
1988	127	1,490	1.2
1989	121	693	1.1
1990	105	560	1.3
1991	165	1,428	2.0
1992	156	3,221	1.6
1993	152	1,926	1.5
1994[2]	97	1,027	1.4
1995[3]	1	2	*
Total	936	10,447	10.2

[1] Includes producers and violating land for which price support or disaster benefits were denied. Benefits denied include price support payments, farm storage facility loans, crop insurance, and insured or guaranteed loans, but do not include a value for price support loans or disaster payments.

[2] Preliminary.

[3] Incomplete.

* Less than $100,000.

Source: USDA, ERS, based on FSA 1995 program data files.

regulatory programs increasingly mitigate conversion pressure arising from economic conditions.

Protection Programs

Until 1978, some government programs encouraged conversion of wetlands to other uses by providing financial and technical assistance (see box, "Evolution of Agricultural Wetland Policy," p. 319). A policy change toward preservation began in the late 1970's, using disincentives and regulation to reduce conversion.

Swampbuster. Indirect Federal assistance for wetland conversion was eliminated by the Swampbuster provision (Title XII C. P.L. 99-198) of the Food Security Act of 1985. The Swampbuster provision made a farm operator ineligible for price support payments, farm storage facility loans, crop insurance, disaster payments, and insured or guaranteed loans for any year in which an annual crop was planted on converted wetlands. Persons sanctioned for Swampbuster violations increased from only 12 in 1987 to 165 in 1991, but have dropped since then (table 6.5.5). Despite intensive debate, few changes were made to Swampbuster provisions in the 1996 Federal Agriculture Improvement and Reform Act.

Section 404 Permits. Wetland conversion is directly regulated by the U.S. Army Corps of Engineers and the Environmental Protection Agency, under Section 404 of the Clean Water Act. Few permit applications under section 404 are actually denied. In fiscal year 1994, the Corps received 48,292 permit applications (table 6.5.6). Of these, 43,753 (91 percent) were authorized through general permits, standard permits, or letters of permission (affecting 17,200 acres); 4,184 (9 percent) were withdrawn (about half of which qualified for general permits, administrative adjustments, or were not required); and only 358 (less than 1 percent) were denied. The Corps estimates that an additional 50,000 activities are authorized each year by general permits that do not require the public to notify the Corps. Of 2,454 enforcement cases in FY 1994, only 70 (3 percent) involving the most egregious circumstances resulted in litigation or administrative penalties (U.S. Army Corps of Engineers, 1995).

Table 6.5.6—Permit actions under section 404 of the Clean Water Act, FY 1994

Action	Number	Percent
General permits issued	39,619	82.0
Standard permits issued	3,760	7.8
Letters of permission issued	374	0.8
Applications withdrawn	4,184	8.7
Permits denied	358	0.7
Total applications	48,292	100.0

Source: USDA, ERS, based on U.S. Army Corps of Engineers, 1995.

Permits for agricultural activities were only 6.7 percent (3,430) of total permits considered in FY 1994. Of these, 87.5 percent were general permits, 11.7 percent were special permits, and 0.9 percent (30 permits) were denied. More than half of the agricultural activities that do require permits involve conversion of wetlands to developed uses. The vast majority of agricultural activities are covered by Section 404 (f) exemptions that preclude permits for "normal" farm activities such as plowing, seeding, cultivating, and harvesting. Most other activities associated with farming are also exempt as long as woody vegetation, if any, is not disturbed.

The Corps has been working to reduce permit evaluation time. While the number of permit actions increased 27 percent in 1990-94, average permit evaluation times dropped by 14 percent. General permit applications took an average of 16 days to process in FY 1994, while denied permits required an average of 164 days, for an overall average processing time of 27 days.

Table 6.5.7—Wetland Reserve Program results, by State, 1992-96

State[1]	Applications received		Applications enrolled	
	Number	*Acres*	*Number*	*Acres*
Louisiana	553	127,549	187	61,912
Mississippi	389	111,044	130	57,872
Arkansas	556	104,542	103	28,883
Missouri	1,005	92,324	198	23,306
Iowa	310	19,887	211	15,860
California	415	169,338	44	15,561
Oklahoma	141	41,676	23	12,777
North Carolina	54	10,725	28	10,725
Wisconsin	164	10,940	134	9,935
Texas	87	73,618	13	9,021
Oregon	33	12,134	17	8,277
South Dakota	149	10,670	84	5,913
Illinois	216	21,136	66	5,795
Tennessee	189	21,328	24	5,746
Nebraska	261	23,655	39	5,111
Minnesota	379	23,629	56	4,493
Washington	105	8,869	23	4,072
Kansas	80	5,834	44	3,894
Indiana	597	25,287	61	3,426
New York	154	7,446	58	3,192
Ohio	350	13,000	62	2,882
Montana	11	2,819	7	2,499
South Carolina	120	7,500	18	2,333
Georgia	115	15,682	4	2,005
Michigan	82	3,191	34	1,995
Maryland	16	1,693	12	1,483
Kentucky	187	16,830	9	1,420
Alabama	89	3,500	6	919
Colorado	28	1,040	10	725
Alaska	1	626	1	626
Virginia	140	21,000	16	623
Pennsylvania	35	1,000	19	516
Maine	11	1,000	3	500
Vermont	43	781	6	200
New Jersey	7	320	2	195
Connecticut	5	341	3	112
New Hampshire	24	103	3	103
Idaho	13	700	2	102
Wyoming	13	2,450	4	84
Delaware	6	52	3	52
Massachusetts	14	310	2	30
Utah	5	3,370	0	0
U.S. total	7,152	1,018,938	1,769	315,175

[1] Ranked in order of acres enrolled. No applications received from Arizona, Florida, Hawaii, Nevada, New Mexico, North Dakota, Rhode Island, and West Virginia.

Source: USDA, ERS, based on NRCS, 1996 (program data summary)

Table 6.5.8—Emergency Wetlands Reserve Program results, by State, 1993-1996

State	Applications received		Applications enrolled	
	Number	*Acres*	*Number*	*Acres*
Iowa	645	57,551	330	36,744
Missouri	496	65,275	128	21,927
South Dakota	152	15,850	81	9,904
Illinois	33	12,736	20	5,651
Minnesota	85	3,000	27	2,241
North Dakota	18	1,500	2	235
Kansas	5	146	4	142
Nebraska	13	233	4	55
Total	1,447	156,291	596	76,929

Source: USDA, ERS based on NRCS, 1996 program data files.

Restoration Programs

Restoration programs include activities to restore prior converted wetlands, enhance wetland function on existing degraded wetlands, and buffer wetlands from surrounding cropland uses.

Wetlands Reserve Program. Restoration of wetlands gained momentum in 1990 with establishment of the Wetlands Reserve Program (WRP). WRP has a goal of restoring 975,000 acres to wetlands by 2002. In the 1996 Farm Act, Congress reaffirmed the enrollment goal and required one-third of enrollments each in 30-year easements, cost-share agreements, and permanent easements. Farmers often express reluctance to cede rights to cropland permanently, and are generally more favorable toward shorter obligations (SWCS, 1994). The WRP program funds USDA to restore wetlands and purchase permanent or long-term easements to restrict agricultural use of the restored wetland. The landowner is allowed certain economic uses of the restored wetland that may reduce the cost of the easement. These uses include hunting, fishing, or other recreational activity, grazing during prescribed times, and selective timber harvesting that is compatible with wetland restoration. The landowner is paid up to 75 percent of the cost of restoring the former wetland.

Following successful WRP enrollments in 1992, 1994, and 1995, Congress appropriated $77 million in FY 1996 to retire more than 100,000 acres of cropland and restore them to wetlands. As of September 1996, USDA enrolled 315,175 acres from 1,769 landowners in nearly every State, out of more than a million acres offered (table 6.5.7). Expanding from 9 pilot States in 1992 to 20 States in 1994, WRP

Evolution of Agricultural Wetland Policy

Encouraging Wetland Drainage, 1780-1977

Early Encouragement 1780-1940—For the first 200 years of U.S. history, the Federal Government approved of and assisted with wetland drainage to further public health and economic development goals. Between 1849 and 1860, the **Swampland Acts** granted 64.9 million acres of wetlands to 15 States on the condition that proceeds of wetlands sold to individuals be used for reclamation projects. States also encouraged wetland drainage by passing legislation enabling creation of local drainage districts (Pavelis, 1987).

Agricultural Conservation Program (ACP), Great Plains Conservation Program (GPCP), and Conservation Technical Assistance (CTA), 1940-77—Cost-sharing and technical assistance for open ditch and tile drainage were used on some 57 million acres of wet farmland, including many wetlands. However, in response to Executive Order 11990 in 1977, USDA prohibited further use of ACP and GPCP cost-sharing for tile or surface drainage, except under limited circumstances.

Small Watershed Program, 1944-1977—Funds for flood control and drainage structures were provided under PL-566 and the PL-534 Flood Control Act. Construction of outlet channels under PL-566 provided drainage outlets for increased farm drainage in wetland areas. In 1977, USDA changed the programs in response to Executive Order 11990 to limit direct impacts on wetlands.

Encouraging Wetland Preservation, 1970 to present

Water Bank Program, 1970—In return for annual per-acre payments, landowners agreed not to burn, drain, fill, or otherwise destroy the character of enrolled wetland areas. Existing Water Bank contracts were terminated after 1990, but landowners could enroll in the Wetland Reserve Program.

Section 404, Federal Water Pollution Control Act Amendments, 1972—The only Federal program regulating wetland conversion is Section 404 dredge and fill permit requirements enacted in the 1972 Federal Pollution Control Act amendments, now called the Clean Water Act.

Food Security Act (FSA), 1985—Indirect Federal assistance for agricultural wetland conversion was eliminated by the wetland conservation provisions (**Swampbuster**) of the 1985 FSA. The Swampbuster provision was a quasi-regulatory policy that made a farm operator ineligible for price support payments, farm storage facility loans, crop insurance, disaster payments, and insured or guaranteed loans for any year in which an annual crop was planted on wetlands converted after 1985. In 1989, **Conservation Reserve Program (CRP)** eligibility was expanded to include wetland that had been cropped for at least two years between 1981 and 1985, but had not been drained.

Tax Reform Act, 1986—This Act restricted or eliminated many provisions that indirectly subsidized agricultural wetland conversion. Among these were deductions for land clearing expenses, deductions for soil and water conservation expenses, and preferential treatment of capital gains, including capital gains realized from draining wetlands.

Food, Agriculture, Conservation, and Trade Act (FACTA), 1990—In addition to some adjustments to the Swampbuster provision, this act authorized a **Wetland Reserve Program (WRP)**. The Act called for restoration of 1 million acres of cropland to wetlands, requiring permanent or long-term easements with the landowner to restrict agricultural use of restored wetland.

Bush Administration Wetlands Plan, 1991—Plan for accelerated regulatory reform, followed shortly by the 1991 interagency wetland delineation manual, substantially revised the 1989 manual. Little progress was made in implementing the Bush plan.

Clinton Administration Wetlands Plan, 1993—An interagency task force led by the new Council on Environmental Quality crafted their own wetland regulatory reform package that embraced the “no net loss” of wetlands goal, streamlined Section 404 permit processing, gave NRCS authority for wetland delineation on agricultural land, and supported wetland restoration through a variety of programs, including WRP.

Federal Agriculture Improvement and Reform Act (1996 Farm Act)—Continued the Wetland Reserve Program with a goal of 975,000 acres and required that, beginning October 1, 1996, one-third of total program acres be enrolled in permanent easements, one-third in 30-year easements, and one-third in restoration only cost-share agreements. Made changes to give farmers more flexibility, including expanding areas where mitigation can be used, providing more options for mitigation, and encouraging effective and timely use of "minimal effect" determinations. Wetland conversion activities, authorized by a permit issued under Section 404 of the Clean Water Act, which make agriculture production possible, will be accepted for farm bill purposes if they were adequately mitigated. The concept of "abandonment" was revised to ensure that Prior Converted designations remain as long as land is used for agriculture. A pilot program for wetland mitigation banking was established. Wetlands are once again eligible for enrollment in CRP.

Table 6.5.9—Wetland enhancement and restoration activity, 1987-95[1]

Program	1987	1988	1989	1990	1991	1992	1993	1994	1995	Total
					Thousand acres					
Partners for Wildlife	2	16	37	42	41	38	35	32	na	243
NAWMP[2]	--	--	38	65	98	88	51	50	na	390
Conservation Reserve	0	0	410	0	0	0	0	0	0	410
Wetland Reserve	--	--	--	--	--	42	0	144	116	302
Emergency WRP	--	--	--	--	--	--	25	0	31	57
Section 404	na	na	na	na	na	na	na	15	38	53
Total	2	16	485	107	139	168	111	241	185	1,455

na = not available

[1] Includes acres of wetlands restored from prior conversion, enhancements of existing degraded wetlands, and upland buffers.

[2] NAWMP = North American Waterfowl Management Plan.

-- = Plan or program not in effect.

Source: USDA, ERS, based on Tolman, 1995; USDA, FSA, 1995; U.S. Army Corps of Engineers, 1995.

operated nationwide in 1995 and 1996. Louisiana and Mississippi enrolled over 50,000 acres each, followed by Arkansas, Missouri, Iowa, California, Oklahoma, and North Carolina with more than 10,000 acres each. No land was enrolled in Florida nor in urbanized States like Rhode Island and Hawaii or in arid States like Arizona, New Mexico, and Utah.

WRP enrollment rose from 43,356 acres in 1992 to 196,747 acres in 1995/96. The average cost of enrollments is $680 per acre; costs range from more than $1,500 per acre in Massachusetts, Missouri, and New Hampshire to less than $500 per acre in Georgia, Minnesota, Oklahoma, South Dakota, Colorado, and Maine.

The Emergency Wetlands Reserve Program (EWRP) was established in 1993, using funds from the Emergency Watershed Protection Program authorized under emergency supplemental appropriations after the Midwest flood. The voluntary program helped landowners convert flood-damaged cropland to wetlands if the cost of the levee restoration and cropland renovation exceeded the value of the land. To date, more than 75,000 acres have been enrolled for restoration to wetlands in eight Midwestern States (table 6.5.8), mostly in Iowa and Missouri. Easement and restoration costs totaled $63 million, or about $800 per acre enrolled.

The U.S. Fish and Wildlife Service's Partners for Wildlife negotiated voluntary, nonbinding agreements with landowners to share the cost of restoring more than 240,000 acres to wetlands since 1987 (table 6.5.9). A related program of joint ventures with State and local governments and private organizations such as Ducks Unlimited and the Isaak Walton League under the North American Waterfowl Management Plan has restored and enhanced almost 400,000 acres since 1989. As discussed above, WRP and EWRP account for more than 390,000 acres of wetland restoration since 1992. CRP put more than 400,000 acres under 10-year contracts in 1989, many of which have been fully restored as functional wetlands. Finally, mitigation requirements under Section 404 restored more than 50,000 acres in 1993 and 1994. Additional mitigation has occurred since 1987, when the Corps adopted guidelines specifically requiring mitigation, but no data are available on restorations earlier than 1993.

Impacts of Proposed Changes to Wetland Programs

Congress proposed a number of changes to current wetlands programs. Proposed restrictions on programs affecting property rights would heavily impact wetland protection programs. In addition, direct changes in wetland protection and restoration programs have been proposed, including extensive changes to how wetlands are delineated. The focus on floodplain management deriving from the extensive flooding in 1993 is also stimulating proposals for change.

Section 404 Permit Program Changes

Some of the most vigorous debate over private property rights reform focuses on the section 404 permit program of the Clean Water Act (see box, "The Private Property Rights Issue," in chapter 1.2, *Land Tenure)*. As a regulatory program, section 404 is potentially vulnerable to "takings" compensation claims. Few permit denials under section 404 lead to

takings claims filed against the Federal Government, and even fewer result in compensation. As of May 31, 1993, only 28 cases involving takings claims had been filed with the U.S. Court of Federal Claims (Claims Court) as a result of a regulatory action under the section 404 program (U.S. General Accounting Office, 1993a). Ten of these cases were decided in favor of the Federal Government, 3 were decided in favor of the claimant, 1 was settled before a decision was rendered, and 14 were still pending as of May 31, 1993. Since 1993, over 30 new takings cases have been filed under the section 404 program (Rugiel, 1996). As of December 31, 1994, three more cases had been decided, two of which were found to involve takings (Meltz, 1995). As of May 1993, the Government had paid compensation in only two cases—a case settled out of court and one of three cases decided in favor of the claimant. The Government has appealed the Claims Court's decisions in the other two cases.

Despite the low number of claims filed thus far, legislating compensation requirements would likely increase claims compensation liability. The Congressional Research Service estimated that compensation on almost 9 million acres would be required under changes to Section 404 in H.R. 1330, at a cost of $10.7 billion (CRS, 1992). Compensation exposure was estimated by the Council of Economic Advisors for a more recent proposal (H.R. 3875) at between $48 and $499 billion, depending on the assumed rate of conversion. ERS estimates of compensation payable under H.R. 925 for diminution in value of wetlands because of Swampbuster provisions range from $705 million to $1.4 billion.

In addition to compensation proposals, the 104th Congress considered other changes to Section 404 wetland regulation as part of Clean Water Act reauthorization amendments. Passed by the House, H.R. 961 requires that land be inundated for at least 21 consecutive days during the growing season to be considered wetlands, exempts small wetlands, and offers full protection only to those wetlands deemed most ecologically significant, requiring compensation for any loss in value of 20 percent or more. Senate Bill 851, introduced in May 1995, contains many of the House provisions, including similar delineation criteria, but has broader exemptions, especially for wetlands on cropland. Action on Clean Water Act reauthorization was not completed in the Senate. Remaining Section 404 protections against wetland conversion could become more important as reductions in commodity program payments reduce the incentive to comply with Swampbuster provisions. Environmental critics of these proposals focus on the large acreage of currently regulated wetlands that could potentially be lost if the delineation criteria that exempt drier wetlands are accepted. While some environmentalists press a more comprehensive, ecosystem-based regulatory approach, others view the proposed legislation as an excessive reaction to problems that can be dealt with administratively (Franco, 1995; Goldman-Carter, 1995).

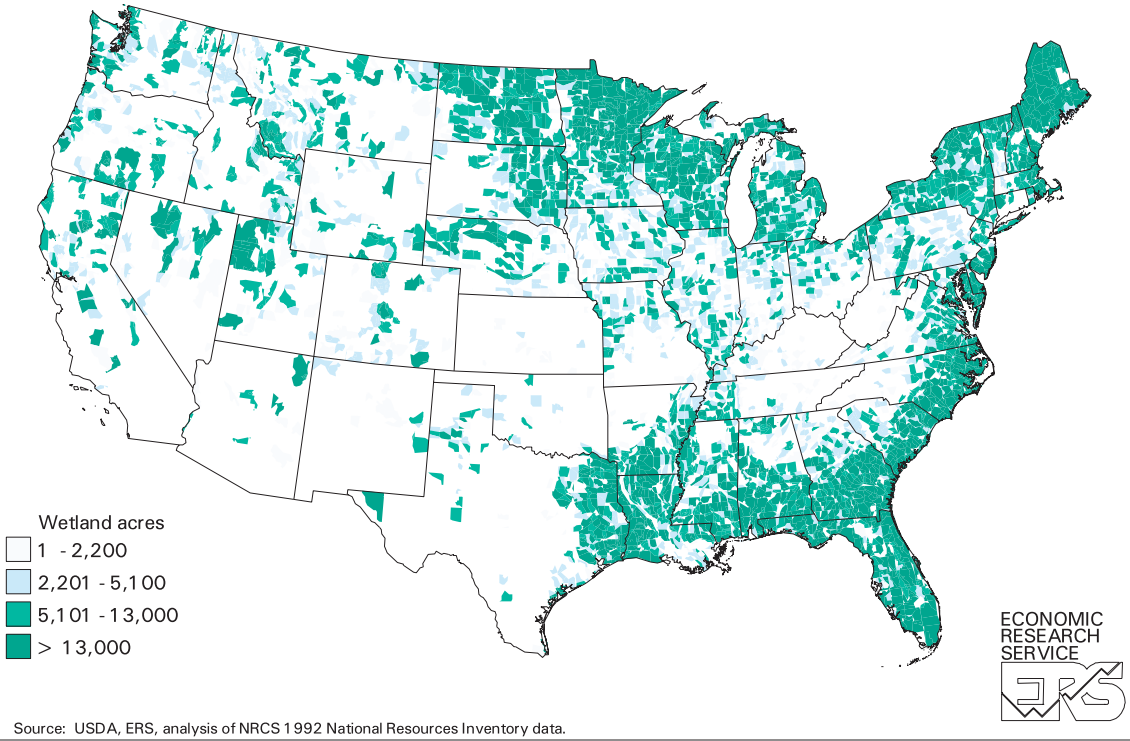
Swampbuster Changes

In contrast to Section 404, the Swampbuster provision is a condition on voluntary participation in Federal programs, and as such is not vulnerable to takings claims under current law. Nevertheless, legislation currently being considered in the 104th Congress would require compensation for diminution in property values due to both section 404 and the Swampbuster provision (see box, "The Private Property Rights Issue," in chapter 1.2, *Land Tenure*).

Two proposals for relaxing Swampbuster provisions were considered during the first session of the 104th Congress. Both proposals would redefine wetlands to reduce the acreage on which drainage would trigger Swampbuster sanctions. Consistent with proposed changes to Section 404, areas subject to Swampbuster would be limited to those typically covered with water (ponded or flooded) for 21 consecutive days during the growing season. Current law requires only that the soil be saturated within 18 inches of the soil surface for 7 consecutive days during the growing season. An estimated 71 million acres would be exempted from Swampbuster provisions under the 21-day criterion, about 82 percent of wetlands currently covered by Swampbuster (fig. 6.5.4). Two-thirds of exempted wetland is currently forested, 13 percent is marshland, while another 18 percent is split evenly between pasture and rangeland. The second proposal, the *cropped wetlands exemption*, would remove Swampbuster sanctions from 6 million acres of wetlands already used for crop production (fig. 6.5.5).

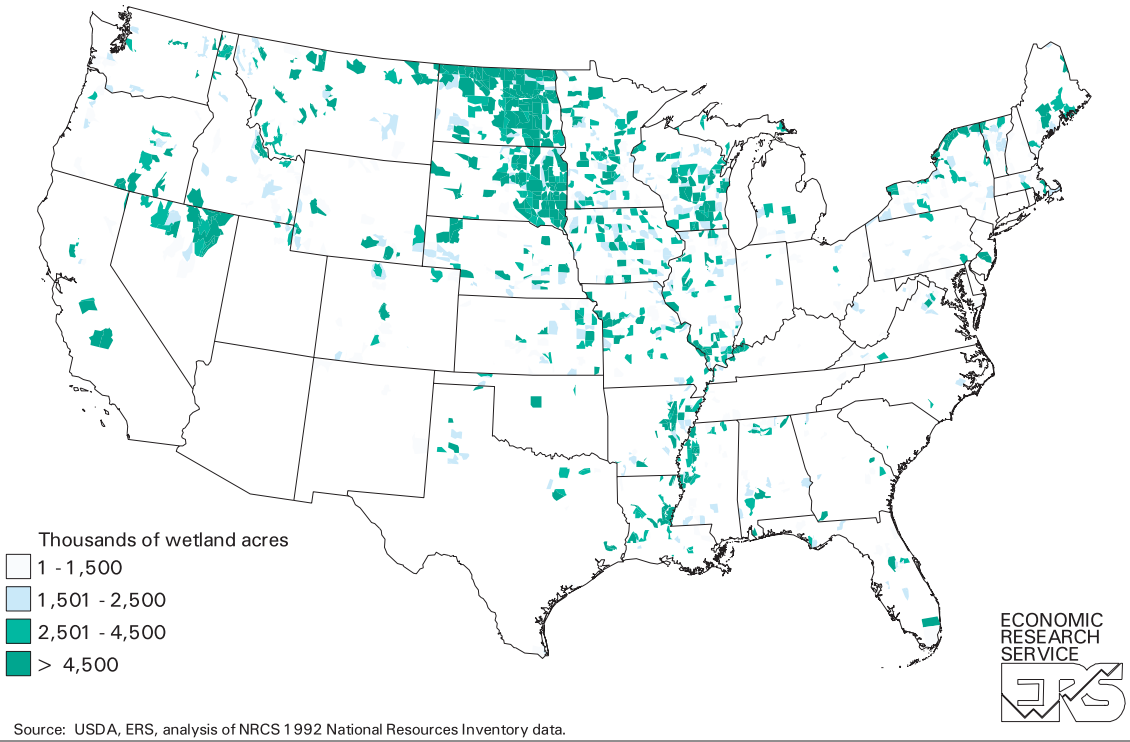
Based on expected crop prices and conversion and production costs, ERS estimated how much of the acreage that would be exempted under these proposals would be profitable to convert to crop production. Under the 21-day criterion and cropped wetland exemptions, drainage is estimated to be profitable on more than 9 million of the 71 million acres of exempted wetlands, more than half of which is located in 5 Southern States: North Carolina (16 percent), Arkansas (13 percent), Georgia (9 percent), Mississippi (7 percent), and Texas (6 percent).

Figure 6.5.4--Wetlands that would be exempted under 21-day proposal



Source: USDA, ERS, analysis of NRCS 1992 National Resources Inventory data.

Figure 6.5.5--Wetlands used in crop production, 1992



Source: USDA, ERS, analysis of NRCS 1992 National Resources Inventory data.

Table 6.5.10—Effects of proposed wetland exemptions on planted acreage, by region

Region	Baseline crop acreage[1]	Short run		Long run	
		21-day criterion	Cropped wetlands exemption[2]	21-day criterion	Cropped wetlands exemption[2]
			Million acres		
Northeast	12.3	0.3	**	0.2	**
Lake State	34.8	0.6	0.1	0.1	**
Corn Belt	84.5	1.5	0.1	0.3	**
Northern Plains	71.5	0.6	0.2	-0.3	**
Appalachia	18.5	1.6	**	1.1	**
Southeast	9.6	1.9	**	1.3	**
Delta States	18.3	2.5	0.1	1.9	0.1
Southern Plains	35.6	0.3	**	**	**
Mountain States	26.3	0.1	**	**	**
Pacific Coast	11.9	**	**	**	**
Total	323.4	9.5	0.7	4.8	0.2

** Fewer than 50,000 acres.

[1] Baseline acreage for commodities in USMP projected for 2001 from *Long-term Agricultural Baseline Projections, 1996-2006*. August 1995.

[2] Cropland acreage equivalents from improving drainage on land already in crop production.

Source: USDA, ERS, based on analysis of 1992 National Resources Inventory data.

Almost all of the cropped wetlands could be further drained for profitable crop production or to remove wetlands hindering farm operation. Because they are already cropped, further drainage of cropped wetlands adds fewer acreage equivalents to production than for newly converted wetlands.

The economic effects of bringing profitable exempted wetlands into production were estimated by ERS using the U.S. Regional Agriculture Sector Model (USMP). In the short run, producers are assumed to act on observed market prices and drain all wetlands where crop production is estimated to be profitable. After longrun adjustments, not all of the wetland acreage drained initially would be kept in production. For both shortrun and longrun scenarios, the estimated net effect of both wetland exemptions is increased planted acreage and production and lower prices. While farmers with acreage to drain may profit from increased production and sales, net cash returns to the farm sector would decline because of lower prices.

In the short run, under the 21-day criterion, soybean acreage would increase in the Delta States, Southeast, and Appalachia (table 6.5.10). The cropped wetlands exemption would increase wheat production in the prairie pothole region of the Northern Plains and soybean production on partially converted, formerly forested wetlands in the Delta States. After longrun adjustments, adoption of these proposed exemptions would increase planted acreage by only half the shortrun increase. Expected declines in net cash incomes would be greatest in the Corn Belt, the Northern Plains, and the Lake States, while increases in net cash income would occur in the Southeast and Delta regions (table 6.5.11). Overall, net cash returns would fall in both the short and long run, but producers in the Southeast, Delta, and Appalachian regions would benefit from increased production more than they lose from reduced prices.

Even though the 1996 Farm Act made few explicit changes to Swampbuster provisions, changes in commodity provisions will reduce Swampbuster's effectiveness in discouraging wetland conservation. The Act decouples farm program payments from current market conditions and phases payments down over 7 years. While the market transition payment still requires compliance with Swampbuster provisions, the disincentive to conversion is reduced proportionally as the payment declines. A producer with many acres of wetlands that could be profitably converted to or further drained for crop production at expected prices may forego commodity program participation when the loss of remaining farm program payments becomes smaller than the potential gain from conversion.

Floodplain Management Changes

Levees built to constrain rivers from their natural floodplains also have resulted in loss of wetlands, loss

Table 6.5.11—Effects of proposed wetland exemptions on net cash income, by region

Region	Baseline net cash income[1]	Short run		Long run	
		21-day criterion	Cropped wetlands exemption[2]	21-day criterion	Cropped wetlands exemption[2]
			$ million		
Northeast	4,108.6	-90.0	-7.6	-47.9	-2.0
Lake States	9,019.6	-588.1	-61.9	-255.2	-10.9
Corn Belt	20,232.4	-2,440.4	-255.6	-908.6	-68.8
Northern Plains	9,897.6	-920.3	-86.0	-405.1	-11.3
Appalachia	2,978.6	-69.4	-14.0	12.0	-4.9
Southeast	2,097.8	43.2	3.8	36.0	0.1
Delta States	4,285.0	-18.4	2.2	13.1	2.0
Southern Plains	6,148.7	-194.9	-19.7	-114.3	-8.0
Mountain States	3,876.8	-142.4	-9.0	-78.0	-3.3
Pacific Coast	5,796.3	-88.6	5.0	-72.1	6.7
Total	68,441.4	-4,309.3	-442.8	-1,816.5	-100.4

[1] Base income for commodities in USMP projected for 2001 from *Long-term Agricultural Baseline Projections, 1996-2006*. August 1995. Does not include deficiency payments.

Source: USDA, ERS, based on analysis of 1992 National Resources Inventory data.

of natural flood storage, and acceleration and amplification of flood flows and flood peaks. In 1993, rainfall that was unusual in both extent and duration resulted in ground saturation and flooding in the Midwest, causing widespread damage and raising questions about whether reliance should be reduced on levees and other flood control structures and whether floodplains should be returned to natural wetlands. As an alternative to restoring flood-damaged levees, the Emergency Wetlands Reserve Program was established in 1993 to help landowners convert flood-damaged cropland to wetlands if the cost of the levee restoration and cropland renovation exceeded the value of the land. Flooding in Georgia (in 1994), California (in 1995), and the mid-Atlantic States and Pacific Northwest (1996) raised further questions about appropriate floodplain management.

The White House Interagency Floodplain Management Review Committee (IFMRC), set up in 1994, found that loss of wetlands and upland cover (primarily to agricultural uses) had significantly increased runoff over the past century and a half, but that wetland restoration would have had little impact on conditions in 1993 (IFMRC, 1994a and 1994b). Economic damage estimates ranged from $12-16 billion, of which over half was accounted for by agriculture. As of June 1994, USDA emergency assistance paid to the nine Midwestern States most severely affected totaled $2.9 billion, most of it for disaster assistance and crop insurance (USDA Flood Information Center, 1994).

Despite the magnitude of losses in 1993, the IFMRC found that reservoirs and levees built by the U.S. Army Corps of Engineers worked essentially as designed, preventing more than $19 billion in potential damages. Watershed projects built by the Natural Resources Conservation Service (previously the Soil Conservation Service) were estimated to have prevented potential damages totaling an additional $400 million. However, they also found that nonstructural solutions—such as permanent evacuation of floodprone areas, flood warning, floodproofing of structures, and creation of additional natural and artificial flood storage—need greater emphasis.

Based on its findings, the IFMRC recommended a variety of administrative and legislative steps, improved coordination of Federal acquisition of environmentally related interests in land from willing sellers (see box, "Floodplain Restoration in Louisa County, Iowa"), and reforms to enhance the efficiency and effectiveness of the National Flood Insurance Program. The National Flood Insurance Reform Act of 1994 restricts lending secured by uninsured or underinsured property located in floodplains, extends the waiting period before new flood insurance policies become effective from 5 to 30 days, and denies Federal disaster assistance to individuals who failed to obtain and maintain flood insurance when required to do so as a condition for receiving disaster assistance.

Floodplain Restoration in Louisa County, Iowa

Levee District 8 covers 3,000 acres of Iowa River floodplain in southeastern Iowa's Louisa County. Prior to 1993, the district had received Federal funds to repair flood-damaged levees 14 times, at a cost of nearly $4 million (in 1993 dollars). The 1993 floods caused a further $757,000 in levee damage (Dettman, 1994). Rather than repair the levees again, the district's board voted in March 1994 to discontinue agricultural operations and disband the district.

As a result of an agreement among landowners, State and Federal agencies, and private conservation organizations, most of the land formerly protected by the district's levees is being reclaimed as part of the Iowa River's natural floodplain and restored to bottomland hardwood forest. The agreement is being implemented through a variety of integrated land acquisition efforts. Most of the district's landowners granted permanent easements to the Federal Government under the Emergency Wetlands Reserve Program (EWRP). Other interests in land, including residual interests in EWRP land, are being purchased by the U.S. Fish and Wildlife Service and by private conservation organizations. In addition to providing wildlife habitat, recreation, and educational opportunities, restoration will ease flooding downstream. The area will be maintained by the Fish and Wildlife Service as part of the Mark Twain National Wildlife Refuge (Wiebe, Kuhn, and Tegene, 1996).

The Midwest floods also prompted a review by the U.S. General Accounting Office (GAO) of how well Federal levees performed in 1993. Citing data from the Corps of Engineers, GAO reported that 157 (81 percent) of the 193 Corps levees located in the flood-affected area prevented severe flooding on about 1 million acres and over $7 billion in damages (GAO, 1995). Of 181 levees for which data were available, 177 performed up to their design capacity: 145 kept floodwaters out of the protected floodplain and 32 were overtopped when the flood exceeded their design capacity. Only 4 Corps levees failed prior to being overtopped. The Corps estimates damage from flooding on about 400,000 acres behind the 36 levees that were breached or overtopped at $450 million. By contrast, the Corps estimates that about 1,100 (81 percent) of the 1,358 nonfederal levees in the flood area failed in 1993.

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Recent Reports on ERS Research on Wetland Issues

"Proposed Delineation Changes for Wetlands." *Journal of Soil and Water Conservation* (1996) 51 (5): 402-407. Sept/Oct. (Keith Weibe, Ralph Heimlich, and Roger Claassen). This article estimates potential wetland conversion from exempting wetlands from Swampbuster provisions, as discussed during the 1996 Farm Bill debate. Short- and long-term economic impacts of exempting 71 million acres of wetlands are estimated based on the profitability of conversion and economic adjustments to increased acreage in production.

"Wetlands Lost, Wetlands Gained." *National Wetlands Newsletter*, (1995) 17(3):1,23-25 (Ralph Heimlich and Jeanne Melanson). This article presents estimates of wetland losses and gains from the 1992 National Resources Inventory and argues that wetland regulatory policies, restoration programs, and economic conditions resulted in nearly achieving the "no net loss" of wetlands goal during the 1980's.

"Property Rights, Partial Interests, and the Evolving Federal Role in Wetlands Conversion and Conservation," *Journal of Soil and Water Conservation*, (1995) 50(6):627-629. Nov.-Dec. (Keith Wiebe, Abebayehu Tegene, and Betsey Kuhn). This article examines the nature of land ownership, the evolving Federal role in wetland use and conservation, and property rights reforms proposed in the 104th Congress. Particular attention is given to the evolution of Federal wetlands policies.

Partial Interests in Land: Policy Tools for Resource Use and Conservation. AER-744, Nov. 1996. (Keith Wiebe, Abebayehu Tegene, and Betsey Kuhn). This report examines the nature of land ownership and the evolving Federal role in land use and conservation. Particular attention is given to the ways in which conservation easements and other partial interests in land are acquired in farmland protection programs, the Conservation Reserve Program, and the Wetlands Reserve Program.

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