Appendix C

Analysis of Alternatives

Models Used in the Analysis

Although a variety of models and other analytical tools were used in the analysis, the three main simulation models were: Environmental Policy Integrated Climate (EPIC), also known as the Erosion Productivity Impact Calculator (Putman et al. 1988, Rosenberg et al. 1992, Edwards et al. 1994, Williams 1995, Wu et al. 1996, Campbell 2000); Agriculture Sector Model (ASM; Chang et al. 1992, McCarl 1993, McCarl and Callaway 1993, McCarl et al. 1993, Chang et al. 1994, Chen 1998, Atwood et al. 2000, Schneider 2000); and the Hydrologic Unit Modeling of the United States (HUMUS; Srinivasan and Arnold 1994, Arnold et al. 1998, Srinivasan et al. 1998). For this analysis, design, development and production of analysis products from these systems were in partnership with Texas A&M University and the Agricultural Research Service.

EPIC is a field-scale model providing a detailed simulation of hydrologic, nutrient, carbon, soil and vegetative growth processes, with environmental consequences simulated to the edge of the field and to the bottom of the root zone. Environmental consequences include estimates of erosion, nutrient and pesticide leaching and runoff and changes in the quantity and quality of the soil resource. Besides producing environmental consequence estimates directly, EPIC is used to calculate per-acre model coefficients for the ASM for alternative crop management technologies and soil types. Some of the data developed for EPIC is also used in the HUMUS modeling system.

The ASM simulates the simultaneous market equilibrium determination process for primary and processed commodities and for land, labor and water resources in the United States, accounting for export and import markets and supply of production inputs. Cropland is divided into classes based on erodibility and other environmental characteristics. Alternative crop production technologies are included, with the model solution process for a given scenario choosing the set of technologies most likely to be used by producers in the situation simulated by the scenario. Model output includes estimates of commodity prices, production, exports, imports; resource use and prices; a description of agricultural technology used and estimates of sheet and rill and wind erosion.

HUMUS consists of three major components: (1) A set of basin-scale Soil and Water Assessment Tool (SWAT) runs that model surface and subsurface water quality and quantity at the 8-digit hydrologic accounting unit scale (2,150 watershed areas); (2) a geographic information system (GIS) to collect, manage, analyze and display the spatial and temporal inputs and outputs; and (3) relational databases needed to manage non-spatial data and drive the models. The acres of crops by watershed can be determined by the ASM model for each alternative scenario and passed to the HUMUS system. Modeling routines for simulating some scenario characteristics such as different types of buffer strips were developed for the SWAT model at a regional scale and were incorporated into the national HUMUS system as part of the analysis.

Appendix C

Modeling changes in agricultural market relationships and policy or program changes

The ASM model is initially set up and calibrated for a specific baseline, usually for the most recent year for which published information is available on commodity prices, yields and disposition and on resources used in production. The parameters of the market relationships in the model for domestic demand and exports and imports of each primary and secondary (processed) commodity can then be changed to reflect the nature of a future scenario. The market relationships are specified with three parameters — baseline quantity, baseline price and the elasticity coefficient for the ratio of percent change in quantity to percent change in price. Supply functions for cropland, groundwater, hired labor and private pasture and range resources have the same three parameters. For example, a scenario to reflect higher export demand for wheat increases the quantity associated with the baseline price and/or changes the responsiveness of the quantity to price. Similarly, an increase in Conservation Reserve Program land can be simulated by reducing the amount of land supplied at a given price. Simulating an increase in the use of conservation tillage is accomplished by imposing a constraint requiring the use of that type of technology in cases where it was not previously employed.

For this analysis, the baseline model solution was calibrated with commodity market conditions for 2000 as reported in the USDA Agricultural Outlook baseline (USDA 2000c). Additional resource availability and management conditions were calibrated to data for year 1997 using the Census of Agriculture and National Resources Inventory data.

The ASM model output was linked with the results from other modeling systems to provide information such as the following:

- changes in levels of production, costs, income and social welfare measures
- changes in crop acres and land uses
- changes in the mixes of crops across soils, tillage types and conservation practices
- changes in levels of production and income by region that can be related to farm size and demographic producer groups using Census of Agriculture data
- changes in crop acres and land use to estimate water quality impacts for selected scenarios using the HUMUS model
- crop acreage distributions and management information combined with the per-acre results from bio-physical models to show a variety of economic and environmental impacts such as erosion, sediment, phosphorus and nitrogen losses to surface water and groundwater
- technical and financial assistance needs associated with each alternative (technical assistance costs based on results from the NRCS Workload Analysis System combined with land treatment needs from the ASM)

The following alternatives were directly analyzed:

BASE: Current program and current conditions as approximated by the USDA baseline for 2000, the 1997 Census of Agriculture, the 1997 National Resources Inventory and Conservation Reserve Program and buffer program data as of September 2000.

Increase buffers to two million miles (BUF2): Simulate imposed enrollment of sufficient buffer acres to reach the two-million-mile goal under the assumption of current rules for CRP, installation costs and rental rates.

Expand the Conservation Reserve Program to 45 million acres (CRP45): Simulate imposed enrollment of acreage to expand the Conservation Reserve Program to 45 million acres under the assumption of continuing with current rules.

Initiate a Grazing Lands Reserve Program (GLR)

GLRa: Fund Grazing Land Reserve at $50 million annually, distributed proportionate to acres.

GLRv: Fund Grazing Land Reserve at $50 million annually, distributed proportionate to value.

Simulate conservation compliance level of erosion control for all cropland (CCALL).

Double the national acreage in mulch and zero till (TILL2X).

Cropland Stewardship Proposal (CSP)

CSP1: Redistribute $5.57 billion in payments in each state to cropland and pasture land that already incorporate sustainable resource management systems.

CSP2: CSP1 plus simulate imposition of erosion control on remaining cropland to conservation compliance levels.

CSP3: CSP1 plus simulate imposition of erosion control on remaining cropland to sustainable resource management systems.

Simultaneous BUF2, CRP45 and CSP2.

Simultaneous BUF2, CRP45 and CSP3.

Increase funding for the Farmland Protection Program to $65 million annually (FPP65).*

Double the Wetlands Reserve Program acreage by enrolling 250,000 acres annually for five years (WRP250).*

Increase funding for the Forestry Incentives Program by $38 million a year (FIP38).*

Increase funding for the Wildlife Habitat Incentives Program to $50 million annually (WHIP50).*

(*Not explicitly modeled, but estimated impacts were developed based on program specification and results of other scenarios.)

BASE — The baseline was calibrated to 1997 conditions for U.S. agriculture

Resource availability and technical data components of ASM were first updated with available 1997 data from the Census of Agriculture (CEN), the National Resources Inventory (NRI) and other sources. The model solution was calibrated to simulate agricultural commodity and resource market outcomes consistent with 1997 conditions. Conservation compliance (CC) participation was assumed to continue at the 1997 level. Miles of conservation buffers were translated to acres in buffers at the rate of 3.6 acres per mile, which is used for program planning purposes.

Only the crop production component of ASM was updated with 1997 NRI data because the full NRI was not available at the start of the analysis. Acreages for pasture, range and irrigation water land components were based on the 1992 NRI and will be updated later. Three crop simulation updates were applied:

- split of cropland into four cropland classes (based on wetness and erosion hazard) by sub-region
- adjustment of per-acre cost, erosion (USLE and Wind) and yields of cropping technologies to 1997 conditions
- calibration so that in the model solution, use of various tillage types and supporting practices were consistent with the NRI and the Crop Residue Management Survey

BUF2 — Increase national miles of conservation buffers to two million miles

In 1997, USDA launched a national initiative to develop two million miles of conservation buffer strips. As of September 2000, 750,000 miles of buffers had been installed (based on 3.6 acres of cropland per mile of buffer). Of that acreage, 1.2 million acres were formally enrolled as part of the nation's 36.4 million-acre Conservation Reserve Program (CRP) through Continuous Signup (CONCRP) provisions. The remaining 1.5 million acres associated with the current buffers were assumed to be distributed in the same proportionate manner across sub-regions and soils as the CONCRP acres.

The BUF2 scenario simulated achievement of the two million-mile buffer initiative by requiring an additional 1.25 million miles of buffers, bringing the total to two million miles (4.5 million additional acres of cropland). Regular CRP and

CONCRP signup were simulated separately. The additional buffer strip acreage was treated as CONCRP signup with the same per-acre costs (private and government) and benefits as land previously enrolled in the CONCRP. BUF2 was simulated by putting cropland-using buffer activities into the model by sub-region and cropland class (for example, adding an additional crop with sub-regional and soil class level constraints on the level of the crop).

The distribution of the additional buffer acres was based on an NRCS comprehensive study of ideal buffer strip distribution for the Buffer Initiative and for program planning for the CONCRP. For this analysis, the sum of current CONCRP enrollment and the additional buffer acres was distributed proportionally to sub-regions based on that ideal distribution as follows: within each sub-region, the new buffer acres were allocated across cropland classes in the same proportions as the classes were allocated to total cropland.

For BUF2:

- expand the CONCRP enrollment by a factor of 2.25 in each sub-region to increase the national total to 2.7 million acres for the buffer "base" (as of September 2000, no explicit distribution data for the buffer acres not enrolled in CONCRP were available)
- redistribute 160,000 acres from the 12 sub-regions where the expansion exceeds the ideal value to the 35 sub-regions with the greatest divergence from ideal
- increase buffer acreage by 20 percent in every sub-region
- calculate the difference (if positive) by sub-region between the ideal distribution and 120 percent of the baseline buffer acreage
- after deducting the 20-percent increase from the total needed 4.5 million-acre increase, distribute the remaining required increase across sub-regions proportionate to each sub-region's share of the national difference between the 120 percent baseline buffer level and the ideal

The costs and benefits of buffer strips were calculated separately for currently enrolled CONCRP acres and for the expanded buffer acres to reflect additional incentives now being offered for enrollments. The following assumptions were used for current CONCRP (rent, cost share and maintenance values were all taken from the current enrollment database):

- the average enrollment contract covers a 12.5-year period
- a discount rate of six percent is used for annualization
- the government cost share is 50 percent of the cost of establishing cover
- the annual maintenance cost paid by the government is included in the rent

With these assumptions:

government cost = (rent + (cost share)*0.116))

producer benefit = (rent - (cost share*0.116) - maintenance)

For the new buffer acres the following assumptions were made:

- average enrollment contract covers a 12.5-year period
- a discount rate of six percent is used for annualization
- cost share is 50 percent of the cost of establishing cover

- government pays an additional incentive equal to 40 percent of private costs of establishing cover
- government pays a signup bonus of $10 per acre per year of enrollment period
- government pays an additional $3.50 per acre maintenance incentive annually
- cost share, maintenance and rent values for previous CONCRP enrollments are used

With these assumptions:

government cost = (rent + 3.5 + (1.8*cost share*0.116) + (125*0.116))

producer benefit = (rent + 3.5 - (0.2*cost share*0.116) - maintenance + (125*0.116))

Per-acre estimates of sheet and rill and wind erosion for CRP land were calculated from the NRI data and used for both current CONCRP and new buffer acres.

CRP45 — Expand Conservation Reserve Program (CRP) to 45 million acres

Baseline CRP enrollment was set at the statutory limit of 36.4 million acres, which is actually a few million acres above current enrollment because of the holdouts for CONCRP and the state-partnered CRP Enhancement Programs (CREEP). The additional 8.6 million acres for the CRP45 scenario were distributed based on the "likely to enroll" database that the Farm Services Agency (FSA) constructed using NRI and economic data provided by the Economic Research Service for the "likely to enroll" estimates. That database considered the environmental benefits scoring used to rank enrollment bids, probable CRP rent level, and estimated profit from continued cropping. However, sample size and other considerations dictated that those estimates be made at the aggregate USDA Farm Production Region 10-region level. Also, the estimates were for the three land classes of ASM that are based on the erosion index (ei) because the "likely to enroll" database does not include Land Capability Class and sub-class information. Government costs, producer benefits and erosion coefficients for CRP land were calculated in the same manner as for the BUF2 scenarios.

To allocate the 10-region acreage estimates to ASM sub-region and soil class, we took the following steps:

- calculate the proportional increase by USDA 10-region need to move from the estimated base to the 45 million-acre CRP
- allocate enrollment to the four ASM land classes assuming the same proportionate split of the new CRP across the four land classes as for previous enrollments
- allocate from the 10 regions to the ASM sub-regions based on the distribution of current CRP

GLRa and GLRv — Grazing Land Reserve Program

Few specifics accompany the proposal that $50 million be spent annually on a grazing land reserve program. Some discussion has focused on protecting land with unique ecological functions, while other discussion centers on

TABLE C-1.
Changes in cropland use (1000 acres)

	Cropped	CRP regular	CRP continuous	Buffer (non-CRP)	Cover or idle	*Total Crop potential	Marginal rent value ($/acre)	Change in rent
BASE	348278.2	30427.6	1500.8	1198.5	17544.1	398949.2	73.16	
Change:								
buf2	-3458.8	0.0	0.0	4499.9	-355.7	685.4	76.00	2.84
crp45	-12059.9	14566.5	0.0	0.0	-1736.6	770.1	79.67	6.51
Till2x	796.4	0.0	0.0	0.0	836.4	1632.8	108.27	35.11
GlrA	-352.0	0.0	0.0	0.0	-406.8	-758.8	74.04	0.80
GlrV	-228.0	0.0	0.0	0.0	-348.8	-576.8	73.98	0.80
csp2	-1735.1	0.0	0.0	0.0	1348.8	-386.3	72.66	-0.82
csp3	-7063.3	0.0	0.0	0.0	6044.0	-1019.2	78.21	5.05
bc2452	-16481.5	14566.5	0.0	4499.9	-1933.4	651.5	80.98	7.82
bc2453	-20891.7	14566.5	0.0	4499.9	1656.0	-169.3	87.08	13.92

*Total crop potential is sum of cropped, CRP, buffers, and cover or idle. Increases in total represent conversions from forest and pasture; decreases are conversion of cropland to forest and pasture.

increasing grazing productivity and/or production of various environmental benefits. For purposes of this simulation, it was assumed that grazing land would be removed from production with compensation paid to the landowners in a program similar to the CRP. Two alternative methods of distributing the funds across the nation were simulated:

- GLRa distributes the funds proportionately across sub-regions based on sub-region proportion of national grazing acres.
- GLRv distributes the funds proportionately across sub-regions based on sub-region proportion of national grazing rent value.

ASM represents grazing land in three categories:

- privately owned pasture land where transactions are in terms of acres
- public grazing land (range) where transactions are in terms of Animal Unit Months (AUMs)
- privately owned grazing land (range) where transactions are in terms of AUMs

Acreage values in ASM for pasture and AUMs for rangeland are taken from Agricultural Statistic and Census related "use" surveys and are generally less than the NRI estimates of pasture and rangeland, particularly in the Appalachian and Southeast regions. Note also that in the ASM, the supply of public grazing by sub-region is represented by fixed quantity and price, while supply of pasture and private grazing are represented by price-responsive supply functions.

The GLRa distribution of grazing land was developed using the following steps:

- determine national acreage shares of pasture and private range in ASM after converting the private AUMs to an acreage basis

- divide the $50 million between national pasture and range proportionate to their total acreages
- divide each of pasture's and range's national fund allocation among sub-regions based on sub-region shares of total acreage

GLRa calculations showed 391.3 million acres of pasture and 152.6 million acres of range, resulting in 72 percent of the funds going to pasture and 28 percent to range.

GLRv distribution of grazing land was developed as follows:

- determine national value shares of pasture and private range in ASM by summing up across states the product of base use and base rent
- divide the $50 million to pasture and range proportionate to their shares of national rent value
- divide each of pasture's and range's national fund allocation among sub-regions based on sub-region shares of total value

The GLRv calculations show national rent values of $6,451 and $642 million for pasture and range, resulting in national GLR shares of 91 percent for pasture and nine percent for range.

The GLR scenarios are modeled in ASM by adding GLR pasture and range activities in each sub-region that "pay" the BASE scenario rent rates and "use" sufficient grazing land resources to expend the allocated GLR funds. The solution showed both the use level and the per-acre cost of enrolling the land by sub-region. Technically, removing that land from production would cause a small increase in the rental rate, implying that actual program implementation would require paying slightly more than the BASE rates. However, in most sub-regions, less than two percent of the grazing land was taken out of production, though as much as 10 percent was removed in a couple of sub-regions. And the ASM solution contains an estimate of how much the rents increase.

CCALL — All cropped acreage will have erosion limited to the CC levels

The conservation compliance (CC) rules have applied to farmers who had traditionally participated in federal farm programs and who farm any highly erodible land (HEL). Those farmers have had qualifying production plans fully implemented since 1995. However, excess erosion continues to be a problem, both from land not covered by the CC provisions and from some CC land. The intent of this scenario is to estimate the costs and benefits to the agricultural sector of requiring that all land be treated in a CC type manner. This simulation requires setting allowable erosion limits as a proxy for the erosion levels associated with approved conservation plans. The implied CC limits assumed for this study are:

- for non-HEL both USLE and wind erosion must be less than six tons
- for HEL both USLE and wind erosion must be less than 10 tons.

Since the erosion levels associated with some of the baseline solution production technologies exceed the CC limits, in the CCALL scenario the ASM will choose the next best (based on economics) cropping activities that meet the CC erosion levels. These next-best technologies may have higher production costs and/or lower yields. The ASM estimates welfare impacts for the sector and describes a new mix of tillage, practices, rotations and, in some cases, different crop mixes by region and cropland class.

TILL2X — Double acreage in reduced tillage at the national level relative to the baseline

Adoption of reduced tillage has slowed at the national level since 1995. This scenario explores the impacts of doubling the current 37 percent of cropland that uses some form of reduced tillage. TILL2X is simulated in ASM by imposing a minimum acreage constraint for each of conservation and zero tillage use in each sub-region. The ASM solution will show both the sector impacts and the sub-regional marginal per-acre costs of adopting those levels of reduced tillage (shadow price of the constraints).

The procedure for developing the distribution of increased reduced tillage across sub-regions has the following steps:

- using Conservation Technology Information Center (CTIC) 1997 data, calculate the proportion of cropped acreage in conservation and zero till for each sub-region
- apply a formula that increases the proportions in these tillage types by sub-region more for areas with lower 1997 proportions and less for areas with higher 1997 proportions, with the cumulative effect of the proportionate increases resulting in national doubling of each type of tillage
- after review by CTIC and NRCS staff, reduce the increase to a doubling in Montana, Oregon, Texas, Washington and Wyoming and to 20 percent in Arizona, California, Connecticut, Florida, Idaho, Maine, Massachusetts, Nevada, New Hampshire, New Mexico, Rhode Island, Utah and Vermont
- spread the remaining acreage needed to meet the national doubling of conservation tillage across sub-regions with large cropland acreages

CSP1, CSP2, CSP3 — Cropland Stewardship Proposal

The Cropland Stewardship Proposal (CSP) simulated in these scenarios was to reflect current policy debates concerning the principal that farmers and landowners should be rewarded for good stewardship already accomplished and that society should be able to expect some stewardship behavior from the landowners in exchange for further government assistance to agriculture. Three model runs were made to simulate CSP, but it should be noted that the analysis was in actuality conducted on the basis of attempting to evaluate implementation of successively higher levels of erosion control rather than assessing progressive levels of incentive payments. Availability of data, time constraints, and modeling constraints limited the scope of what could be incorporated in this analysis. A more comprehensive analysis is needed to estimate benefits and effects for resource management systems, new comprehensive nutrient management, pesticide management, and wildlife habitat management systems to adequately address proposed stewardship incentive provisions currently being considered.

Appendix C

CSP1 involves a lump sum redistribution (within each sub-region) of $5.57 billion in direct payments to acres of cropland and pasture currently managed at erosion levels below the soil loss tolerance rate (T). These payments were added to the objective function as income to the farming sector by sub-region and are also included in government cost accounting at the sub-region level. The procedures for allocating these payments are:

- determine by sub-region the 1997 NRI acreages of crop and pasture with erosion less than T
- apply the following formula in each sub-region to solve for a pasture payment rate (y), and the calculate rates for the cropland classes as multiples of the pasture rate as shown

$AMTA = yP + 3.5yW + 3.5yL + 4.5yM + 6.5yS

where

$AMTA is the AMTA payment total;

P is acreage of qualifying pasture;

W is acreage of qualifying cropland with Class III-VIII, subclass w;

L is the non-W qualifying cropland with erosion index less than 8.;

M is the non-W qualifying cropland with erosion index between 8 and 20; and

S is the non-W qualifying cropland with erosion index greater than 20.

The average per-acre payments and the national allocations by ASM cropland class were:

	ASM class	per acre	acres (millions)	allocation (millions)
P	Pasture	$4.48	112.9	$505.8
W	III-VIII with w	$19.55	33.7	$658.8
L	ei < 8	$18.24	189.1	$3449.2
M	8<=ei<20	$19.79	36.2	$716.4
S	ei >=20	$26.19	9.1	$238.3

The CSP1 payments were also included in the CSP2 and CSP3 scenarios. The intent of CSP2 was to determine the additional economic impact of requiring that erosion is reduced to six tons per-acre on non-HEL and 10 tons per-acre on HEL. This solution should be the same (for resource allocation and management) as CCALL because the CSP1 payments are included only as lump sum transfers. The erosion control aspects of this scenario are set up as in CCALL (that is, by eliminating cropping activities where either wind or water erosion exceeds the specified limits). However, farm income and government payment estimates will be different from CCALL because of the CSP1 payments.

CSP3 is similar to CSP2, except that both water and wind erosion (individually) will be reduced to the soil loss tolerance level for all cropland as a means of simulating implementation of resource management systems.

BC2452 Simultaneous BUF2, CRP45, and CSP2

BC2453 Simultaneous BUF2, CRP45, and CSP3

TABLE C-2.

Farm income implications from National Conservation Program Analysis, average annual changes from current levels

U.S. agricultural sector impact:		buf2	crp45	Till2X	GlrA	GlrV	csp1*	ccall	csp2
Producers	Million $	528.9	1890.20	-5723.60	708.5	596.2	0	-230.7	-230.7
U.S. consumer	Million $	-673.1	-1433.70	383	-641	-543.7	0	-750.5	-750.5
U.S. taxpayers[2]	Million $	523.6	712.9	1801.90	50	50	0	218.4	218.4
Total financial cost[2]	Million $	-667.7	-256.4	-7908.40	17.5	2.5	0	-1199.50	-1199.5
Technical Assistance									
Federal	Million $	125.1	290.9	1158.40	12.6	12.6	0	247.1	278.1
Partner	Million $	0.0	0	786.6	8.5	8.5	0	167.8	188.9
Total technical assistance	Million $	125.1	290.9	1945.00	21.1	21.1	0	414.9	467
Total cost[2]	Million $	792.8	547.3	9853.40	38.6	23.7	0	1614.40	1666.50
Estimated environmental benefits3	Million $	3288.10	1532.80	4960.40	-16.9	-31.3	0	6827.90	6827.90
Benefit cost ratio	Ratio	4.1	2.8	0.5	-0.4	-1.3	0	4.20	4.10
Producers'income	% change	0.81	2.91	-8.8	1.09	0.92	0	-0.35	-0.35
Crop commodity indices:									
Production	Index	99.32	98.12	99.14	99.94	99.95	100	99.57	99.57
Price	Index	101.36	103.62	101.41	100.17	100.12	100	101.19	101.19
Total Cropped Acres	% change	-1.00	-3.50	0.20	-0.10	-0.10	0	-0.50	-0.50
Cropland with new conservation[4]	% change	2.40	2.90	-0.20	-0.20	34.20	0	4.00	4.00
Crops per-acre change (%):									
Variable costs	% change	1.09	3.02	4.74	-0.01	-0.01	0	0.66	0.66
Receipts	% change	1.64	4.88	0.92	0.16	0.06	0	1.34	1.34
Profit	% change	4.04	12.95	-15.61	0.87	0.34	0	4.28	4.28
Crops per-acre change ($):									
Variable costs	$ change	1.82	5.03	7.91	-0.02	-0.01	0	1.10	1.10
Receipts	$ change	3.38	10.02	1.9	0.32	0.12	0	2.75	2.75
Profit	$ change	1.56	4.99	-6.01	0.34	0.13	0	1.65	1.65
Sector change (%):									
Crop	Receipts	0.67	1.68	0.54	0.11	0.07	0	0.75	0.75
Crop	Var. costs	0.19	-0.98	7.32	-0.13	-0.08	0	0.04	0.04
Crop	Profit	3.13	15.38	-34.45	1.35	0.87	0	4.43	4.43
Livestock	Receipts	0.23	-0.12	-0.32	1.41	1.34	0	0.09	0.09
Livestock	Var. costs	-0.02	-0.09	0.10	-0.05	-0.03	0	-0.05	-0.05
Livestock	Profit	0.44	-0.14	-0.71	2.81	2.65	0	0.23	0.23

Appendix C

csp3	bc2452	bc2453	wrp	fpp	whip	fip	reduce resource degradation: glr, wrp, fpp, whip & fip[1]	improve resource health: glr,wrp, fpp, whip & fip
2182.60	3668.6	6285.4	n/a	n/a	n/a	n/a	3668.6	6285.4
-5,084.90	-3040.9	-7209.6	n/a	n/a	n/a	n/a	-3040.9	-7209.6
954.7	1611.10	2257.30	263.5	23.5	41.3	31.3	2020.70	2666.80
-3857.00	-983.4	-3181.50	263.5	23.5	41.3	31.3	-1392.90	-3591.10
1451.50	681.5	1780.70	22.5	5.1	9	6.8	737.4	1836.60
985.6	180.3	926.7	0	0	0	0	188.9	935.2
2437.00	861.8	2707.40	22.5	5.1	9	6.8	926.3	2771.90
6294.00	1845.20	5888.90	286	28.6	50.2	38.1	2319.30	6362.90
10,428.00	7426.10	10,666.50	n/a	n/a	n/a	n/a	7426.10	10,666.50
1.7	4	1.8	n/a	n/a	n/a	n/a	3.2	1.7
3.36	5.64	9.67	n/a	n/a	n/a	n/a	5.64	9.67
97.35	97.45	95.41	n/a	n/a	n/a	n/a	97.45	95.41
108.24	105.69	112.91	n/a	n/a	n/a	n/a	105.69	112.91
-2.00	-4.70	-6.00	n/a	n/a	n/a	n/a	-4.70	-6.00
13.70	6.00	14.70	n/a	n/a	n/a	n/a	6.00	14.70
2.47	4.05	5.93	n/a	n/a	n/a	n/a	4.05	5.93
7.43	7.63	14.19	n/a	n/a	n/a	n/a	7.63	14.19
28.9	23.16	49.95	n/a	n/a	n/a	n/a	23.16	49.95
4.12	6.8	9.9	n/a	n/a	n/a	n/a	6.8	9.9
15.25	15.7	29.1	n/a	n/a	n/a	n/a	15.7	29.1
11.13	8.92	19.25	n/a	n/a	n/a	n/a	8.92	19.25
5.41	3.11	7.83	n/a	n/a	n/a	n/a	3.11	7.83
1.48	-2.11	-0.91	n/a	n/a	n/a	n/a	-2.11	-0.91
25.7	30.04	52.9	n/a	n/a	n/a	n/a	30.04	52.9
0.52	0.79	0.78	n/a	n/a	n/a	n/a	0.79	0.78
-0.19	-0.23	-0.33	n/a	n/a	n/a	n/a	-0.23	-0.33
1.2	1.77	1.84	n/a	n/a	n/a	n/a	1.77	1.84

table continues on next page

TABLE C-2. (continued from previous page)

U.S. agricultural sector impact:		buf2	crp45	Till2X	GlrA	GlrV	csp1*	ccall	csp2
Total	Receipts	0.36	0.46	-0.04	0.99	0.93	0	0.3	0.3
Total	Var. costs	0.07	-0.49	3.35	-0.09	-0.05	0	-0.01	-0.01
Total	Profit	0.8	1.9	-5.15	2.62	2.42	0	0.78	0.78
Sector change (Million $):									
Crop	Receipts	457.5	1145.00	367.2	74.9	49.7	0	514.7	514.7
Crop	Var. costs	110.2	-559.2	4185.80	-74.8	-47.1	0	23.8	23.8
Crop	Profit	347.2	1704.20	-3818.60	149.7	96.8	0	490.9	490.9
Livestock	Receipts	309.4	-166.3	-455.5	2023.10	1919.70	0	128.5	128.5
Livestock	Var. costs	-15.6	-61.1	67.9	-35.8	-21.7	0	-36.6	-36.6
Livestock	Profit	324.9	-105.2	-523.4	2058.90	1941.40	0	165.1	165.1
Total	Receipts	766.9	978.7	-88.3	2098.00	1969.40	0	643.2	643.2
Total	Var. costs	94.7	-620.3	4253.70	-110.7	-68.8	0	-12.8	-12.8
Total	Profit	672.2	1599.00	-4342.00	2208.60	2038.20	0	656	656
Change in cropped acreage	Mil. acres	-3.5	-12.1	0.8	-0.4	-0.2	0		-1.7
Change in cropland rent[5]	$ per acre	2.84	6.51	35.11	0.8	0.8	0		-0.82
Trade surplus	% change	0.01	-1.08	-1.99	0.17	0.08	0	-0.13	-0.13
Trade surplus	Million $	2	-228.8	-423.5	35.9	16.7	0	-28.4	-28.4
Environmental Impacts[6]									
Erosion	% change	n/a	-6.9	-22.3	0.1	0.1	0	-30.7	-30.7
Sediment	% change	-15.6	-6.7	-27.3	0.1	0.1	0	-33.2	-33.2
Total nitrogen	% change	-10.8	-2.8	-7.2	0	0.1	0	-12.5	-12.5
Total phosphorus	% change	-11.7	-4.5	-14.4	0.1	0.1	0	-19.7	-19.7

Footnotes for Tables 5-8, 10-14 and C-2:

* No change in impacts because payments were held constant for each region even though there could be income redistribution to producers in each region who already have fully implemented conservation systems.

n/a not available.

Technical Assistance costs based upon results from the NRCS workload analysis system combined with land treatment needs from Agricultural Sector model.

1 WRP, FPP, WHIP, and FIPcould not be included in the modeling analysis and are not included in benefit estimates for bc2452 and bc2453. ERS estimates a benefit cost ratio of 2.21 for treatments on highly erodible cropland (Economic Research Service 1997).

2 U.S. taxpayer cost represents direct payments to producers for rent and practice installations. Total sector impact equals impact on producers plus consumers less direct payments. Total cost is positive sum of sector impact plus technical assistance.

3 Estimated environmental benefits include soil, water, air quality and wildlife habitat benefits. The analysis presumes that additional acreage retired and conservation treatments are optimally located to maximize environmental benefits. Complete accounting and quantifiable estimates for all environmental benefits are not yet available in the literature. Of benefits currently estimated, wildlife habitat is just over 50 percent, water quality is 35 percent, soil productivity is 10 percent, and air quality is four percent of the total. Arecent analysis of national and regional benefits can be found in Claassen et al. 2001.

Appendix C

csp3	bc2452	bc2453	wrp	fpp	whip	fip	reduce resource degradation: glr, wrp, fpp, whip & fip[1]	improve resource health: glr,wrp, fpp, whip & fip
2.1	1.54	3.05	n/a	n/a	n/a	n/a	1.54	3.05
0.56	-1.07	-0.59	n/a	n/a	n/a	n/a	-1.07	-0.591
4.42	5.48	8.55	n/a	n/a	n/a	n/a	5.48	8.55
3691.60	2124.1	5340.2	n/a	n/a	n/a	n/a	2124.1	5340.2
843.1	-1204	-519.9	n/a	n/a	n/a	n/a	-1204	-519.9
2848.50	3328.1	5860.1	n/a	n/a	n/a	n/a	3328.1	5860.1
747	1135.3	1118	n/a	n/a	n/a	n/a	1135.3	1118
-130	-160.1	-230.2	n/a	n/a	n/a	n/a	-160.1	-230.2
877	1295.4	1348.2	n/a	n/a	n/a	n/a	1295.4	1348.2
4438.60	3259.4	6458.2	n/a	n/a	n/a	n/a	3259.4	6458.2
713.0	-1364.1	-750.1	n/a	n/a	n/a	n/a	-1364.1	-750.1
3725.50	4623.6	7208.3	n/a	n/a	n/a	n/a	4623.6	7208.3
-7.1	-16.5	-20.9	n/a	n/a	n/a	n/a	-16.5	-20.9
5.05	7.82	13.92	n/a	n/a	n/a	n/a	7.82	13.92
-1.07	-1.56	-3.29	n/a	n/a	n/a	n/a	-1.56	-3.29
-227.6	-332.1	-701.9	n/a	n/a	n/a	n/a	-332.1	-701.9
-46.9	-33.4	-47.9	n/a	n/a	n/a	n/a	-33.4	-47.9
-55.5	-35.9	-55.5	n/a	n/a	n/a	n/a	-35.9	-55.5
-15.8	-17.9	-19.6	n/a	n/a	n/a	n/a	-17.9	-19.6
-26.3	-25.7	-31	n/a	n/a	n/a	n/a	-25.7	-31.0

4 Acres with new conservation accounts for conservation tillage, terraces, contouring, strip cropping, or cropland idled to grass (but not in CRP). Does not include soil quality enhancing management practices, nutrient management, rotations, etc.

5 Offset in buffer and CRP scenarios by government rent payments.

6 Buffers to two million miles based upon HUMUS model outcome for estimated delivery to water bodies, all other estimates based upon ASM/EPIC model results for edge of field. WRP and FPP based upon 2001 budget, WHIP and FIP estimated. Partner technical assistance estimated at .679 of federal; CRP, buffers, and WRP are federal only. Total partner technical assistance and financial assistance was $734 million in 2000. Financial assistance needs for till2x, csp2, csp3, bc2452, and bc2453 based on model output for cropland idled to grass, acres of dry, and irrigated land with new conservation tillage, terraces, contouring, or strip cropping practices using the following dollar amounts: $10 per acre for crop idled to grass; $15 per acre for conservation till and other practices. Based upon inflation adjusted ACPaverage.