

Table 10. Erosion > 'T' in 1930, 1982 and 1992 in the 28 counties predominantly in the Northern Mississippi Valley Loess Hills (MLRA 105)

Items	1930	1982	1992	Percent changes		
				1930-82	1930-92	1982-92
1. Cropland eroding excessively, 1,000 ac	3,438	2,260	1,764	-34	-49	-22
a. As percent of all principal crops	87.0	44.4	38.5	--	--	--
2. Gross erosion rate, tons/ac/yr	16.7	14.9	13.4	-11	-10	-11
3. Excess erosion rate, tons/ac/yr	11.9	10.4	8.9	-13	-25	-15
4. Average tolerance rate, tons/ac/yr	4.8	4.5	4.5	--	--	--
5. Gross erosion, 1,000 tons/yr	58,136	33,674	23,638	-42	-60	-30
6. Excess erosion, 1,000 tons/yr	41,277	23,504	15,670	-43	-62	-33
a. As percent of item 5	71	70	66	--	--	--
b. As percent of all cropland erosion	70	59	54	--	--	--

Item Explanations

Item 1. Data for 1982 and 1992 from the National Resources Inventory, except that cropland areas for all years are based on acreages as reported in the 1930, 1982 and 1992 Censuses of Agriculture. Acreages estimated by applying the percentages in 1a to the total area in principal crops given in table 8. The percentage in 1a for 1930 is from a detailed analysis for the five sample counties of any excessive erosion for the same 437 soil series/phase designations used to estimate total erosion for the region .

Items 2 and 3. Gross and excessive erosion rates per acre per year for 1930 are from the detailed sample county analysis for 437 soils or soil complexes, of which 327 involved one or more rotation combinations where excessive erosion occurred in 1930. The excess erosion rate is the erosion rate in excess of the tolerance rate 'T', weighted by the area over which it occurs. That is, excess rate = [Sum (gross erosion rate - T) times area involved] / Sum (all areas), where only the areas eroding above T are considered.

Item 4. The tolerance or 'T' values for the soils in the study area range between 2 and 5 tons per acre per year. This is the rate of displacement above which appreciable losses of soil productivity can occur because of erosion processes. The average 'T' can be approximated as the difference between the average gross and excessive rates of erosion.

Item 5. Gross erosion on land eroding excessively estimated as the product of item 1 and the gross erosion rates per acre in item 2.

Item 6. Excess erosion estimated as the product of item 1 and the excessive erosion rates per acre in item 3.

region were in the Conservation Reserve in 1994. The enrollments accounted for roughly 85 percent of all cropland not harvested in the region, and for 18 percent of the cropland considered highly erodible. The CRP acreage was about 1/7th as large as the combined area in row crops, small grains and meadow.¹⁶

For the seven years 1986-1992 the Consolidated Federal Funds Report indicates that, in 1992 prices, Federal rental payments to farmers under the CRP for the 28 counties in MLRA 105 have averaged about \$1.0 million per county per year. The average for the five sampled counties alone was \$1.8 million per county per year, and for the 23 nonsampled counties was \$960 thousand per county per year. This is generally consistent with the proportions of cropland classed as highly erodible. Highly erodible cropland in the five sample counties averages 67.5 percent of all cropland, according to NRI data for 1982, 1987 and 1992. The proportion of cropland highly erodible in the 23 counties not sampled averages 60 percent.

The CRP doubtless has been important in protecting previously farmed land. The vegetative cover of the CRP areas is likely grass or trees, and thus not included in the cropland area for which we calculated per-acre erosion rates. Between 1982 and 1992 there was a net reduction of 507,000 acres in the area devoted to principal crops for which erosion rates were estimated, but it was not possible to allocate the reductions in total erosion between 1982 and 1992 specifically to the CRP, because the enrolled land was not necessarily used for crops in 1982.

The contribution of conservation practices to reduced erosion and sedimentation in the Trimble and Lund study can be verified by examining Census of Agriculture reports on land use changes from 1930-1974 and from 1974-1992, particularly the changes in corn and other row crops in Monroe, Vernon and La Crosse counties in Wisconsin.

The acres in row crops in the three counties increased between 1930 and 1992 by 136 percent, or from 75.8 thousand acres in 1930 to 178.7 thousand acres in 1992. The 1992 figure includes 22.9 thousand acres of highly erodible land in the Conservation Reserve Program. Further, about 73 percent of the 1930-92 gain for row crops occurred in the interval from 1930 to 1974.

Watershed Protection

Under the Watershed Protection and Flood Prevention Act of 1954 and its various amendments (Public Law 566), six watershed projects have been initiated in the sample counties and at least 20 more in other counties within MLRA 105 (figure 10). The required or recommended

¹⁶ Data on enrollments in the CRP for the 28 counties principally in MLRA 105 were provided by Tim Osborn of the Economic Research Service, USDA.

Table 11. Erosion control and other conservation practices in 1982, 1987, and 1992 in MLRA 105.

Practices ¹	Extent in 1982	Extent in 1987	Extent in 1992
	<u>1,000 ac</u>	<u>1,000 ac</u>	<u>1,000 ac</u>
A. Cropland Practices:	<u>4,203.6</u>	<u>4,770.2</u>	<u>5,422.9</u>
327 Conservation cover	NR	NR	643.0
329 Conservation tillage (NRI) ²	1,237.3	1,664.2	1,695.8
Conservation tillage (CTIC) ²	NR	NR	1,335.2
330 Contour farming	900.3	884.9	1,000.6
392 Field windbreaks	36.8	39.2	34.0
393 Filter strips	0	0.1	0.1
412 Grass waterways/outlets	823.0	897.8	1,057.1
585 Stripcropping, contour	1,091.8	1,164.7	1,216.2
586 Stripcropping, field	NR	NR	2.2
589 Stripcropping, wind	7.8	3.6	4.3
600 Terraces	108.3	119.7	130.2
B. Grazing Land Practices:	<u>398.3</u>	<u>275.9</u>	<u>436.1</u>
342 Critical area planting	NR	NR	26.6
410 Grade stabilizations	59.9	66.3	68.0
510 Pasture/hay management	262.3	167.2	256.1
528 Proper grazing use	76.1	42.4	85.4
C. Woodland Practices:	<u>165.6</u>	<u>209.8</u>	<u>266.2</u>
612 Tree planting	63.9	102.4	82.1
654 Improved wood harvest	NR	NR	109.4
666 Woodland improvement	101.7	107.4	74.4
Totals, all practices	<u>4,767.5</u>	<u>5,255.9</u>	<u>6,125.2</u>

¹ Practices as coded and sampled in the 1992 National Resources Inventory (NRI). Margins of error not available for this NRI data set. NR = not reportable or comparable for 1982 and 1987.

² NRI = estimate from National Resources Inventory; CTIC = estimate from Conservation Technology Information Center.

Northern Mississippi Valley Loess Hills (MLRA 105)

with Status of Watershed Projects

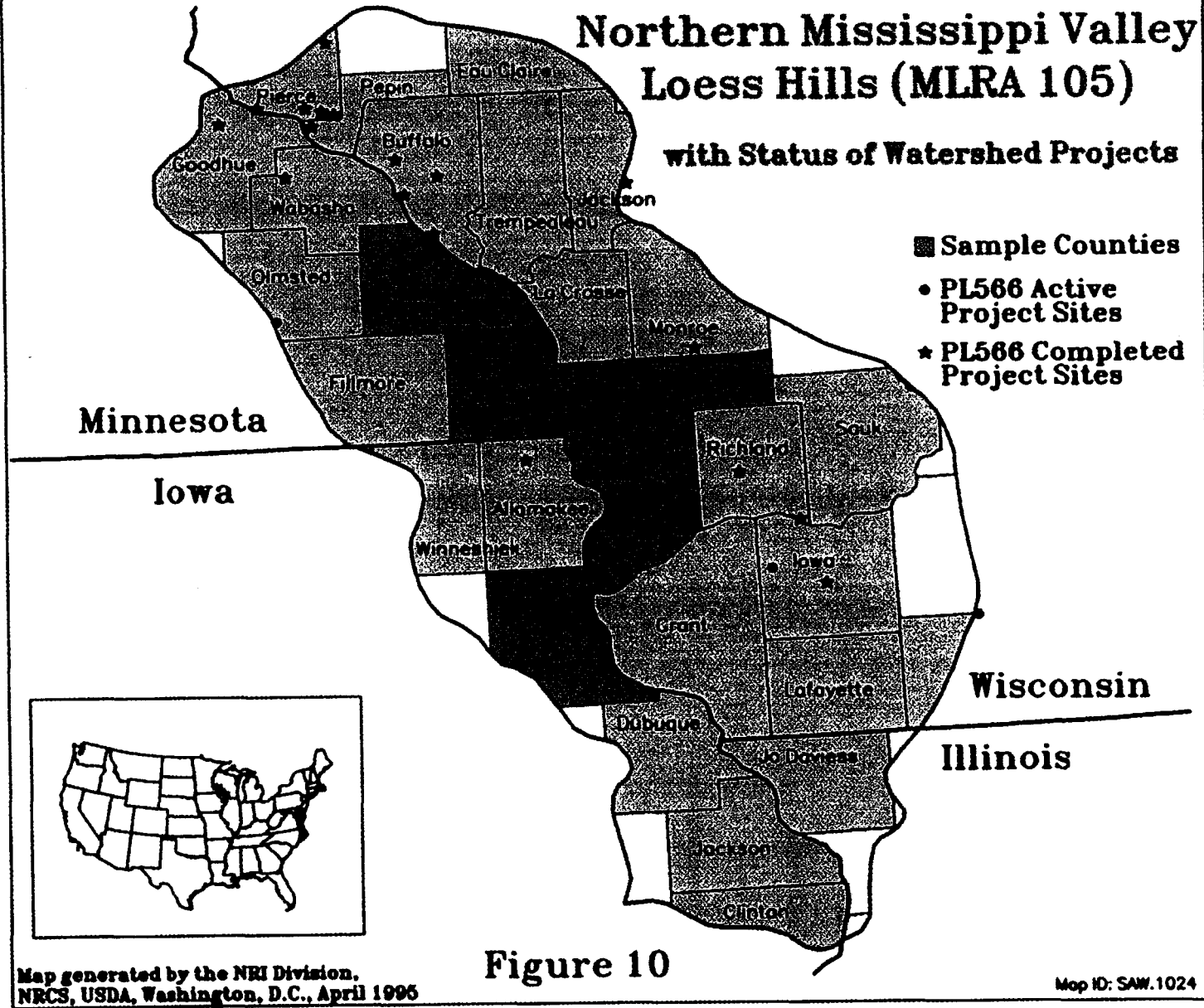


Figure 10

Map generated by the NRI Division.
NRCS, USDA, Washington, D.C., April 1995

Map ID: SAW.1024

land treatment measures and/or structural improvements have been completed in 23 of the projects. Regulations implementing the legislation required that a minimum of 50 percent of the land tributary to structures have recommended conservation treatments in place, meaning that erosion rates have been brought down to tolerance (T) levels for the soils concerned. In practice the areas so treated run at least 75 percent and in many cases 100 percent (Miller,1995).¹⁷

Assessing the specific benefits and costs of watershed projects in MLRA 105 was not an objective of this study, but available data indicate that the annual flood prevention benefits from land treatment and structural measures in the 25 watershed projects in MLRA 105 average about \$170 per acre of floodplain affected. A general requirement for economic feasibility in authorizing watershed works of improvement is that expected annual benefits be at least equal to average annual costs, including amortized initial investments and operating and maintenance costs.

Benefits are calculated as the reduction in average annual flood damages that were occurring under predevelopment conditions. Estimated average annual benefits per floodplain acre are \$105 for the two projects in MLRA 105 in Iowa, \$285 per acre for the six Minnesota projects, and \$36 per floodplain acre for the 17 projects in Wisconsin. These benefit estimates are adjusted to 1993 price levels.

Evaluations by Trimble and Lund in 10 subbasins within the Coon Creek Basin area, covering parts of La Crosse, Monroe and Vernon counties in Wisconsin, illustrate how improved land use, conservation practices, and impoundment structures interact in producing benefits. They found that the gross erosion rates averaged across all land uses in the tributary areas they studied were reduced from 13.4 tons/ac/yr in 1934 to 3.28 tons/ac/yr in 1974. The reductions ranged between a minimum of 69 to up to 80 percent in particular subbasins. Gully erosion had been fully contained. Sediment delivery ratios (reservoir deposition as a percent of gross erosion) for the years 1962-75 averaged 7.8 percent. Sediment yield was virtually eliminated by improved land management and conservation practices, as was the net rate of sedimentation on floodplains (Trimble and Lund,1982,pp.10-13,21). Average annual flood damage reduction benefits in the still-active Coon Creek Project are estimated at 1993 prices to be about \$20 per acre for the 1,300 acres of floodplain (Miller,1995).

¹⁷ Estimates in this section of the flood prevention benefits of Public Law 566 watershed projects in Illinois, Iowa, Minnesota and Wisconsin have been provided by Dennis Miller of the NRCS State Office for Iowa.

Possible Related Studies

The Northern Mississippi Valley Loess Hills (MLRA 105) studied here typify water-related sheet and rill erosion conditions. Candidate areas for possible similar studies are listed in Appendix D, with notes on the extent of erodible land, major crop and livestock enterprises, and the severity of erosion problems evaluated in the Reconnaissance Erosion Survey of 1934 (RES). The information is largely from the RES reports, recent agricultural censuses, and the manual Major Land Resource Regions and Areas of the United States (USDA,1981).

For MLRA 105 the national RES reports indicated that much of the steeply rolling land bordering the Volga River in Clayton County, Iowa was severely eroded in 1934, although overall, a relatively small portion of the Mississippi loess region in Iowa had been eroded severely (U.S. National Resources Planning Board,1936,p.65, hereinafter the U.S.Board).

Iowa: At a more specific level, the RES was conducted, tabulated, and published for all 100 counties in Iowa (Walker and Brown,1936). Clayton County especially, but also Jackson and Winneshiek Counties within MLRA 105, were eroding most severely. The two counties accounted for about 60 percent of all moderately eroding and for over 75 percent of the severely eroding land in the six Iowa counties in MLRA 105. Unfortunately, while the Walker-Brown report contains county and even some township erosion data for both urban and rural land in the State, it does not focus clearly on cropland or other agricultural areas. A similar State-level report was prepared for Missouri (Baver,1935). It described severe erosion conditions in agriculture, but as in Iowa the county data were also for all lands, not for cropland or other farm uses.

Minnesota: In Minnesota the RES indicated that the major area of sheet and gully erosion extended from Wright County southward along the Mississippi River to the Iowa and Wisconsin borders (U.S.Board,p.71). No reference to a detailed State RES report for Minnesota was found, but a good insight into how the soil and erosion surveys of the time were conducted was obtained by Helms in a personal interview with Robertson (Helms,1982b).

Wisconsin: The RES also found serious erosion problems in the southwestern Wisconsin counties along the Mississippi River. About 3 million acres had lost from 25 to 75 percent of their topsoil. These lands were also severely gullied, primarily because of excessive grazing on forest land and the cultivation of very steep slopes (U.S.Board,1936,p.93).

A later erosion survey conducted by the Soils Department at the University of Wisconsin categorized erosion by degrees of severity on cropland for all counties in the State, ranging from

negligible, slight, medium, and severe on up to extreme, with the degree determined by the inches of topsoil lost (Muckenhirn and Zeasman, ca.1940).¹⁸

Results of the 1940 Survey for the 15 Wisconsin counties in MLRA 105 are in table A-12. If a suitable 'benchmark' year could be established on when such losses effectively began in each county, it may be possible to approximate average annual erosion rates in tons/ac/yr from the benchmark year up to the survey year 1940. While probably interesting, the erosion rates determined in such an exercise could not be compared with the rates estimated in our MLRA 105 study using the Universal Soil Loss Equation,

Texas: The Reconnaissance Erosion Survey in Texas was conducted at two levels: (1) The entire State was surveyed using the national erosion classifications and criteria; and (2) a companion and more specific survey was made for the Brazos River Watershed, an area of 42,400 square miles, roughly 2.25 times as large as the Northern Mississippi Valley Loess Hills.

The Brazos Basin includes all or parts of 105 counties and cuts across seven Major Land Resource Areas. The Brazos survey dealt with water-related erosion, and estimated the acres of land eroded to various degrees for several categories: cultivated land with sheet erosion, gullied cultivated land not terraced, terraced cultivated land, pasture gullied or not gullied, and woodland gullied or not gullied (Geib and Goddard,1934). The proportions of topsoil lost were not estimated.

One alternative for comparing current erosion conditions with those existing at the time of the Brazos Survey would involve replicating the MLRA 105 study, for one or more of the land use categories above. The USLE erosion rates reconstructed for the base year 1934 would be compared with USLE rates from the National Resources Inventories for 1992 or other years.

A second alternative would compare over time such measures as the acres in various land uses and/or land use capability classes with erosion limitations, and the acres adequately or not adequately treated. This approach could perhaps use information of this kind compiled in the National Resources Inventories (NRI) and similar inventories dating back to 1958.

A third alternative is to evaluate wind erosion conditions over time within a region where wind erosion was the major problem identified in the 1934 Reconnaissance Erosion Survey. In this case the recommended standard of comparison would be the Revised Wind Erosion Equation (RWEQ) as applied to the year 1934 and to the 'present' time for a selected and relatively small area. The RWEQ is still being developed.

¹⁸ In his study of rotations and soil erosion Uhland determined that an acre-inch of topsoil weighs from 142 to 152 tons (Uhland,1949,p.2).

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Appendix A
Supplemental Tables
 (Short titles)

Table A-1. Land use patterns in 1930 and 1992 for five sample counties versus all 28 counties in MLRA 105.....	72
Table A-2. Pasture and woodland use in 1930 and 1992 for five sample counties versus all 28 counties in MLRA 105.....	73
Table A-3. Crop and agricultural land uses in 1930 for five sample counties.	74
Table A-4. Major cropland use in 1930 for five sample counties.....	75
Table A-5. Average annual yield estimates for 1930 conditions in sample counties.....	76
Table A-6. USLE 'C' Factors, 1930 conditions, Low Productivity Levels.....	77
Table A-7. Distribution of rotations and crops in Clayton County, Iowa in 1930.....	79
Table A-8. Principal cropland uses and soil erosion in 1930 and 1992 in MLRA 105.....	80
Table A-9. Remaining erosion control needs in 1992 on cropland, pastureland, forest land, and other land uses in MLRA 105.....	81
Table A-10. Comparison of 1992 National Resources Inventory and Census of Agriculture estimates of cropland and other land uses in MLRA 105.....	82
Table A-11. Sheet and rill erosion rates on cropland and other land uses in the 1992 National Resources Inventory for MLRA 105.....	83
Table A-12. Soil erosion in 1940 in the 15 Wisconsin counties in MLRA 105, by degrees of erosion and approximate inches of topsoil lost.....	84

Table A-1. Land use patterns in 1930 and 1992 for five sample counties versus all 28 counties in MLRA 105, the Northern Mississippi Valley Loess Hills

Crop and Land Use Items	5 sample counties 1930 ¹	5 sample counties 1992 ¹	MLRA 105 total 1930	MLRA 105 total 1992	MLRA 105 change, 1930-1992
	<u>1,000 ac</u>	<u>1,000 ac</u>	<u>1,000 ac</u>	<u>1,000 ac</u>	<u>Percent</u>
A. Principal crops	647	756	3,952	4,583	15
1. Row crops	238	454	1,187	2,748	131
2. Close-grown crops	260	51	1,650	316	-81
3. Rotation meadow	149	251	1,115	1,519	36
B. Net cultivated ²	640	749	3,915	4,530	15
C. Other harvested crops ³	226	81	1,240	192	-85
D. Cropland harvested (B+C)	866	830	5,155	4,722	-9
E. Cropland not harvested	41	121	212	796	--
1. Crop failure	8	7	37	53	43
2. Conservation Reserve ⁴	33	105	175	677	--
3. Diversion programs ⁴	--	9	--	66	--
F. All croppable land (D+E)	907	951	5,367	5,518	2
G. Noncroppable land	1,083	740	5,700	3,783	-34
1. Cropland only grazed ⁵	175	133	1,224	770	-38
2. Pasture, not wooded	158	114	1,229	670	-46
3. All woodland	660	434	2,704	1,779	-35
4. Farmsteads and other land	90	59	543	564	3
H. All land in farms (F+G)	1,990	1,691	11,067	9,301	-16
I. <u>Number of farms</u>	<u>12,891</u>	<u>6,720</u>	<u>71,048</u>	<u>35,330</u>	<u>-50</u>

¹ Sample counties: Clayton (Iowa); Houston and Winona (Minnesota); and Crawford and Vernon (Wisconsin).² Less than item A by failed crops (item E1).³ Includes hay not in rotation, fruits, and other minor crops.⁴ Items not applicable in 1930; Percent changes not computed. Item E2 includes small idle acreage not CRP.⁵ For this study cropland only grazed and not in rotation is considered as pastureland.

Table A-2. Pasture and woodland use in 1930 and 1992 for sample counties versus all 28 counties in MLRA 105

Pasture and woodland uses	Five counties 1930	MLRA 105 total 1930	MLRA 105 total 1992	MLRA 105 change 1930-1992
	<u>1,000 ac</u>	<u>1,000 ac</u>	<u>1,000 ac</u>	<u>Percent</u>
A. All land pastured or grazed ¹	907	4,641	2,236	-52
1. Woodland grazed	574	2,188	796	-64
2. Permanent pasture, not wooded	158	1,229	670	-45
3. Cropland used for pasture	175	1,224	770	-37
B. All woodland in farms ¹	660	2,704	1,779	-34
1. Woodland grazed	574	2,188	796	-64
2. Woodland not grazed	86	516	983	90
C. Woodland grazing, 1,000 acres	574	2,188	796	-64
1. Percent of all grazing, (A1/A)	(63)	(47)	(35)	--
2. Percent of all woodland, (B1/B)	(87)	(81)	(45)	--
D. All land in farms, 1,000 acres	1,990	11,067	9,147	-18
1. Percent used for pasture, (A/D)	(45)	(42)	(24)	--
2. Percent in woodland, (B/D)	(33)	(24)	(19)	--

Source: Censuses of Agriculture for 1930 and 1992.

¹ Items A and B are not additive; note that grazed woodlands are an element of both A and B.

Table A-3. Crop and agricultural land uses in 1930 for five sample counties in the Northern Mississippi Valley Loess Hills (MLRA 105)

Crop and Land Use Items	Clayton County, Iowa	Houston County, Minnesota	Winona County, Minnesota	Crawford County, Wisconsin	Vernon County, Wisconsin
	<u>1,000 ac</u>	<u>1,000 ac</u>	<u>1,000 ac</u>	<u>1,000 ac</u>	<u>1,000 ac</u>
A. Principal crops	219.0	94.5	147.1	73.1	113.6
B. Net harvested ¹	216.2	93.8	145.2	72.2	112.5
C. Other harvested crops	20.0	46.0	37.6	40.9	81.1
1. Fruits and minor crops	3.4	2.5	4.1	1.9	4.2
2. Hay, w/o rotation hay ²	16.6	43.5	33.5	39.0	76.9
D. Cropland harvested, (B+C)	236.2	139.8	182.8	113.1	193.6
E. Cropland not harvested	9.3	3.4	5.8	8.3	4.8
1. Crop failure (see B)	3.0	0.7	1.9	0.9	1.1
2. Cropland idle	6.3	2.7	3.9	7.4	3.7
F. All cropped land, (D+E)	245.5	143.2	198.6	121.4	198.4
G. Non cropped land	218.5	190.3	177.3	206.7	290.4
1. Cropland only grazed	61.1	25.0	24.1	22.2	42.4
2. Pasture, not wooded	39.1	21.0	24.2	26.9	46.5
3. All woodland	94.6	129.6	112.5	140.4	182.6
4. Farmsteads or other land	23.7	14.7	16.5	17.2	18.9
H. All land in farms, (F+G)	464.0	333.5	375.9	328.1	488.8
I. Total land area, (Census)	498.9	361.6	396.8	363.5	513.3
J. <u>Percent land in farms, (H/I)</u>	93	92	95	91	95
K. <u>Number of farms</u>	2,993	1,910	2,058	1,915	4,016

Source: Censuses of Agriculture for 1930 and 1992.

¹ Less than item A by acres of failed crops (item E1). The main crops, including rotation meadow, are listed in table A-2.

² Rotation hay included within cultivated crop use.

Table A-4. Major cropland use in 1930 for five sample counties in MLRA 105

Cultivated Cropland Uses ¹	Clayton County, Iowa	Houston County, Minnesota	Winona County, Minnesota	Crawford County, Wisconsin	Vernon County, Wisconsin
Soil Survey Years	1925/82	1929/84	1936/94	1930/62	1928/69
	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>	<u>Acres</u>
All Cultivated Cropland²	<u>219,000</u>	<u>94,500</u>	<u>147,100</u>	<u>73,100</u>	<u>113,600</u>
1. Row crops:	<u>90,100</u>	<u>36,800</u>	<u>39,100</u>	<u>30,300</u>	<u>42,200</u>
011 All Corn*	86,400	35,200	36,000	26,800	31,200
013 Soybeans ³	--	--	--	--	--
016 Tobacco*	--	--	--	2,400	8,900
018 Irish potatoes*	1,400	1,000	2,100	800	1,400
019 Vegetables*	2,300	600	1,000	300	700
2. Close-grown crops:	<u>75,500</u>	<u>35,800</u>	<u>74,600</u>	<u>26,100</u>	<u>47,800</u>
111 Wheat*	1,300	2,000	7,900	1,100	1,400
112 Oats*	64,600	24,200	35,400	19,500	36,400
114 Barley*	9,200	8,600	26,300	5,300	9,900
116 Other; rye, flax	400	1,000	5,000	200	100
3. Rotation meadow:*	<u>53,400</u>	<u>21,900</u>	<u>33,400</u>	<u>16,700</u>	<u>23,600</u>
a. Clover, clover/timothy	42,800	15,830	25,186	9,015	12,027
b. Legume/grass seeds	8,168	3,663	5,891	3,836	5,266
c. Alfalfa hay	1,643	2,054	2,248	2,881	6,142
d. Sweet clover pasture	536	306	89	781	141
e. Annual legumes hayed	216	16	6	166	58

¹ Cropland uses primarily from the Census of Agriculture for 1930 and State Crop Reports.

² Crops with * used in estimating soil erosion in 1930 from the Universal Soil Loss Equation (USLE).
Numeric codes for crops are as used in the 1992 National Resources Inventory.

³ In 1930 soybeans were grown largely as emergency hay. Any soybean acres are within Item 3e.

Table A-5. Average annual expected yield estimates under 1930 conditions in five sample counties in MLRA 105¹

Crop	Yield units per acre	Clayton County Iowa	Houston County Minnesota	Winona County Minnesota	Crawford County Wisconsin	Vernon County Wisconsin
Corn for grain	bu/ac	40	40	35	50	45
		A	B	E	F	G
Oats for grain	bu/ac	40	35	35	40	40
		B	B	E	F	G
Wheat grain	bu/ac	20	15	15	25	20
		C	B	E	F	G
Barley	bu/ac	30	30	30	30	35
		C	C	C	C	D,G
Rye	bu/ac	12	15	12	12	--
		C	C	C	C	--
Hay meadow	tons/ac	1.8	1.8	1.8	1.5	1.8
		D	D	D	D	D
Potatoes	bu/ac	90	100	100	100	95
		D	D	D	D	D
Tobacco	cwt/ac	--	--	--	14	12
		--	--	--	D,F	G

¹ Letters below each estimate identify primary sources as A, B, C, etc. If data were not available for a particular county, the estimates are based on reports available for nearby areas.

- A. Clayton County and Northeast Iowa District average, 1929-35
- B. Houston County, Minnesota and Southeast Minnesota District average, 1929-35
- C. Jo Daviess County, Illinois and Northwest Illinois District average, 1925-35
- D. 1930 Census of Agriculture for the County
- E. Winona County and Southeast Minnesota District average, 1929-35
- F. Soil-based estimates from the 1930 Crawford County Soil Survey
- G. Soil-based estimates from the 1928 Vernon County Soil Survey

Table A-6. USLE 'C' Factors, MLRA 105, 1930 conditions, Low Productivity Levels *

No.	Crop Sequence	Residue Management	Tillage		
			Fall MP	Spring MP	Spring Disk
006	Corn after grass-legume meadow	Harvest for grain, residue left	0.36	0.26	---
007	Corn after grass-legume meadow	Residue grazed after harvest for grain, or standing crop grazed	0.36	0.27	---
009	Corn after grass-legume meadow	Harvest for silage, or stover removed after harvest for grain	0.36	0.31	---
		Means, 006, 007, 009	0.36	0.28	--
016	Corn after corn, second year after grass-legume meadow	Harvest for grain, residue left	0.53	0.45	0.30
017	Corn after corn, second year after grass-legume meadow	Residue grazed after harvest for grain, or standing crop grazed	0.53	0.47	0.31
019	Corn after corn, second year after grass-legume meadow	Harvest for silage, or stover removed after harvest for grain	0.52	0.51	0.37
		Means, 016, 017, 019	0.53	0.48	0.33
021	Corn after corn, 3 + years after M	Harvest for grain, residue left	0.53	0.49	0.32
022	Corn after corn, 3 + years after M	Residue grazed after harvest for grain, or standing crop grazed	0.53	0.50	0.33
024	Corn after corn, 3 + years after M	Harvest for silage, or stover removed after harvest for grain	0.53	0.54	0.38
		Means, 021, 022, 024	0.53	0.51	0.35
026	Corn after grain, 3 + years after M	Harvest for grain, residue left	0.62	0.49	0.32
027	Corn after grain, 3 + years after M	Residue grazed after harvest for grain, or standing crop grazed	0.62	0.50	0.33
029	Corn after grain, 3 + years after M	Harvest for silage, or stover removed after harvest for grain	0.62	0.51	0.38
		Means, 026, 027, 029	0.62	0.51	0.35

--continued

Table A-6. USLE 'C' Factors, MLRA 105, 1930 conditions, Low Productivity Levels--continued

No.	Crop Sequence	Residue Management	Tillage		
			Fall MP	Spring MP	Spring Disk
034	Spring small grain after grass-legume meadow	Harvest for grain, straw removed after harvest, stubble left	0.18	0.14	---
036	Spring small grain after grain, second year after legume meadow	Harvest for grain, straw removed after harvest, stubble left	0.31	0.23	0.19
042	Spring small grain after corn, second year after grass-legume meadow	Harvest for grain, straw removed after harvest, stubble left	0.22	0.21	0.18
044	Spring small grain after grain, 3+ years after M	Harvest for grain, straw removed after harvest, stubble left	0.31	0.23	0.19
046	Spring small grain after corn, 3 + years after M	Harvest for grain, straw removed after harvest, stubble left	0.23	0.23	0.19
066	Grass-legume meadow, 1st yr, seeded w/spring small grain nurse crop	No hay harvested	0.08	0.14	0.10
070	Established grass-legume meadow	Harvested for hay	0.01	---	---
071	Irish potatoes after corn or grain, 3+ years after M (average of values from current FOTG, WI & MN)	Clean tillage	0.35	0.33	0.31
073	Vegetables after corn or grain, 3+ years after M (from current FOTG, Wisconsin, average of values for snapbeans and sweet peas)	Clean tillage	---	0.50	---

* Based on a more detailed factor table prepared September, 1994 by Scott Argabright, Midwest National Technical Center, NRCS, USDA. These sequences are illustrated as applied in Clayton County, Iowa.

Table A-7. Illustrated distribution of rotations and crops in Clayton County, Iowa in 1930

Crop/Soil Groups and Rotations ¹	Rotation Distributions		Crops Distributed by Soil Groups and Rotations				
	Percent ²	Acres	Vegetable	Potatoes	Corn	Sm. Grain	Meadow
<u>Group AB:</u>	<u>100.00</u>	<u>58,000</u>	<u>2,300</u>	<u>1,400</u>	<u>29,310</u>	<u>20,670</u>	<u>4,320</u>
CP, GP	4.83	2,800	--	1,400	700	700	--
CV, GV	7.93	4,600	2,300	--	1,150	1,150	--
CG	50.00	29,000	--	--	14,500	14,500	--
CCCGM	37.24	21,600	--	--	12,960	4,320	4,320
<u>Group C:</u>	<u>100.00</u>	<u>11,900</u>	--	--	--	<u>7,933</u>	<u>3,967</u>
GGM	100.00	11,900	--	--	--	7,933	3,967
<u>Group D:</u>	<u>100.00</u>	<u>149,100</u>	--	--	<u>57,155</u>	<u>45,973</u>	<u>45,972</u>
CGM	70.00	104,370	--	--	34,790	34,790	34,790
CCGM	30.00	44,730	--	--	22,365	11,183	11,182
All Groups, 1930 acres		219,000	2,300	1,400	86,465	74,576	54,259
1930 Census, acres		219,000	2,300	1,400	86,400	75,500	53,400
Pct. deviation from reports		0	0	0	< 1%	-1.2%	+1.6%
Pct. of all acres, 1930		100	1%	1%	40%	34%	24%
1992 Census, acres		259,508	10	--	³ 189,227	15,271	55,000
Pct. of all acres, 1992		100	< 1%	< 1%	74%	5%	21%

¹ Rotation crops: C=corn; G=small grains (mainly oats); M=rotation meadow; P=Irish potatoes; V=all vegetables (including sweet corn, melons, etc.).

² Percent denotes share of acres in each crop/soil group assigned to each crop rotation, from Argabright worksheet of 1/12/95.

³ Acres for 'corn' in 1992 include 17,427 acres of soybeans as a comparable crop.

Table A-8. Principal cropland uses and soil erosion in 1930 and 1992 in the Northern Mississippi Valley Loess Hills (MLRA 105)

Cropland and crop groups	Cropland in group	Soil loss rate per acre ¹	Gross soil loss per year	Distribution of crops by groups		
				Row crops	Small grains	Meadow
	<u>1,000 ac</u>	<u>Tons/ac/yr</u>	<u>1,000 tons</u>	<u>1,000 ac</u>	<u>1,000 ac</u>	<u>1,000 ac</u>
Principal Crops, 1930 total	3,952	14.9	58,885	1,187	1,650	1,115
				(31)	(41)	(28)
Principal Crops, 1992 total	4,583	6.3	28,904	2,748	316	1,519
				(61)	(6)	(33)
Increase or decrease, 1930-1992	631	-8.6	-29,981	1,561	-1,334	404
Percent change, 1930-1992	(16)	(-58)	(-51)	(131)	(-81)	(36)

¹ Soil loss rates for 1930 as evaluated in this study by crops estimated grown on the various land use capability classes. Mean estimated soil loss rate for 1992 is for all crops combined, from the 1992 National Resources Inventory.

Table A-9. Estimated remaining erosion control needs in 1992 on cropland, pastureland, forest land, and other land uses in MLRA 105

Land uses	Five sampled counties	MLRA totals, 28 counties	Clayton County, Iowa only
(Margins of error in parentheses) ¹	<u>1,000 ac</u>	<u>1,000 ac</u>	<u>1,000 ac</u>
All cropland	347.4 (51.9)	2,710.5 (128.2)	120.4 (23.7)
Pastureland	38.0 (18.9)	186.3 (37.8)	2.7 (3.7)
Forest land	0 (0)	0 (0)	0 (0)
Miscellaneous /minor uses	8.5 (6.0)	70.8 (24.5)	1.6 (0.8)
Totals, all uses	393.9 (55.7)	2,967.6 (132.6)	124.7 (24.3)

Source: 1992 National Resources Inventory, Natural Resources Conservation Service, USDA.

¹ Estimated acreage minus and plus the margin of error gives the lower and Northern limits of the 95-percent confidence interval.

Table A-10 Comparison of 1992 National Resources Inventory (NRI) and Census of Agriculture estimates of cropland and other land uses in MLRA 105

Land uses	Clayton County, IA		5 Sample Counties		Totals for MLRA 105	
	NRI	Census	NRI	Census	NRI	Census
(Error margins in parentheses) ¹	<u>1,000 ac</u>	<u>1,000 ac</u>	<u>1,000 ac</u>	<u>1,000 ac</u>	<u>1,000 ac</u>	<u>1,000 ac</u>
A. Principal crops	225.4	259.5	765.7	756	5,135	4,583
	(28.3)	--	(74.1)	(18.1)	(160)	(105)
1. Row/close-grown crops	173.9	204.5	508	505	3,413	3,064
	(25.4)	--	(61.1)	--	(138)	--
2. Grass/legumes	51.5	55.0	257.7	251	1,722	1,519
	(16.4)	--	(43.0)	--	(107)	--
B. Other crop uses	4.7	14.0	12.20	138	74.7	781
	(4.4)	--	(11.8)	--	(24.7)	--
C. All cropland	230.1	273.5	777.9	894	5,209	5,364
	(28.3)	--	(74.7)	--	(161)	--
D. Pastureland	56.2	100.2	301.9	247	1,772	1,440
	(15.8)	--	(47.5)	--	(109)	--
E. Woodland/other	163.2	118.3	1,049.6	493	5,220	2,343
	(29.2)	--	(81.3)	--	(174)	--
F1. All land uses	449.5	464.0	2,129	1,634	12,201	9,147
	(14.7)	--	(74.7)	--	(125)	--
F2. Adjusted totals ²	657	492	1,572	1,634	9,324	9,147

Sources: 1992 National Resources Inventory, USDA Natural Resources Conservation Service, and U.S. Census of Agriculture, 1992.

¹ NRI estimates of land uses minus and plus the margins of error give the lower and upper limits of the 95-percent confidence interval.

² F2 is an adjusted NRI estimate for all land in farms. It is obtained by subtracting from F1 the NRI estimate for woodland, etc. (E), then adding back in the Census estimate for E, all woodland and other minor farmland uses.

Table A-11. Sheet and rill erosion rates on cropland and other land uses estimated in the 1992 National Resources Inventory for MLRA 105

Land uses	Five sample counties, erosion rate 1992	MLRA 105, all 28 counties		
		Erosion rate 1992	Land uses 1992	Gross erosion 1992 ²
(Error margins in parenthesis) ¹	<u>tons/ac/yr</u>	<u>tons/ac/yr</u>	<u>1,000 ac</u>	<u>1,000 tons/yr</u>
A. Principal crops	5.5 (0.8)	6.5 (0.3)	5,134.5 (160.2)	33,434 (3,351)
1. Row/close-grown crops	6.7 (1.0)	7.9 (0.4)	3,412.7 (138.0)	27,015 (2,455)
2. Grasses/legumes	3.3 (1.1)	3.6 (0.5)	1,721.8 (106.9)	6,251 (1,245)
B. Other cropland uses	3.2 (4.1)	6.4 (3.5)	74.7 (24.7)	478 (253)
C. All cropland	5.5 (0.8)	6.5 (0.5)	5,209.2 (161.3)	33,908 (2,611)
D. Pastureland	1.1 (0.3)	1.2 (0.2)	1,772.1 (109.2)	2,148 (485)
E. Woodland/other	0.1 --	0.4 (0.3)	5,220.4 (173.5)	2,140 (1,635)
F. All land uses	2.2 (0.3)	3.1 (0.2)	12,201.8 (124.6)	37,850 (2,827)

¹ Estimated (a) erosion rates, (b) land use areas, and (c) gross erosion tonnages minus and plus the margin of error gives the lower and upper limits of the 95-percent confidence interval. For (a) and (b) the margins of error are directly from the National Resources Inventory. For (c) the margins of error are estimated as the differences between the upper (or lower) limit of calculated gross erosion.

² This column gives estimates of average annual erosion under 1992 land use and other conditions.

Table A-12. Soil erosion in 1940 in the 15 Wisconsin counties in MLRA 105, by degrees of erosion and approximate inches of topsoil lost

County	Total cropland area	Erosion negligible < 1.0 in.	Slight erosion 1.0-3.9 in.	Medium erosion 4.0-8.9 in.	Severe erosion 9.0-12 in.	Ruined land 12+ in.
	<u>1,000 ac.</u>	<u>1,000 ac.</u>	<u>1,000 ac.</u>	<u>1,000 ac.</u>	<u>1,000 ac.</u>	<u>1,000 ac.</u>
Crawford	371	25	30	35	7	3
Vernon	522	22	60	71	15	4
Subtotal, 2 counties	893	47	90	106	22	7
(Pct. of cropland)	(100)	(5)	(10)	(11)	(2)	(1)
Buffalo	449	32	40	43	10	10
Eau Claire	411	17	63	42	6	3
Grant	738	67	85	88	20	6
Iowa	485	26	64	66	7	2
Jackson	639	39	40	41	6	2
La Crosse	302	36	27	28	4	2
Lafayette	401	46	57	55	8	2
Monroe	583	50	54	49	8	2
Pepin	150	12	10	23	7	4
Pierce	370	39	36	66	20	6
Richland	377	16	46	50	7	2
Sauk	537	59	66	66	10	3
Trempealeau	475	67	47	42	19	6
Total, all counties above	6,810	553	725	765	154	57
(As pct. of cropland)	(100)	(8)	(11)	(11)	(2)	(1)
(As pct. of State)	(19)	(15)	(24)	(30)	(28)	(38)
Wisconsin total	35,123	3,600	3,014	2,474	542	148
(As pct. of cropland)	(100)	(10)	(9)	(7)	(2)	(<1)

Source: *Soil Erosion in Wisconsin* (R.J. Muckenhirn and O. R. Zeasman). Wisconsin University Special Report, undated report based on field surveys conducted June 1940.

Appendix B

MLRA 105, the Northern Mississippi Valley Loess Hills

Illinois, Iowa, Wisconsin, and Minnesota
Total land area 18,860 sq.mi (48,847 sq.km), natural basis

(Area as defined in The National Resources Inventory and this study; descriptions from *Major Land Resource Regions and Areas of the United States*. (U.S. Department of Agriculture, Soil Conservation Service. 1981, Agriculture Handbook 296, p.77.); also see pp.151,156 and accompanying aerial photographs for southwestern Wisconsin and southeastern Minnesota in the USDA monograph *Land Use and Its Patterns in the United States*(Marschner, 1959).

Land Use

Nearly all this area is in farms, but only about two-fifths in cropland. Feed grains and forage for dairy cattle and other livestock are the principal crops. About one-fifth of the area is permanent pasture. Nearly one-third, mainly the more sloping parts, consists of farm woodlots used for commercial timber production and for farm products. The Mississippi River and major tributaries provide opportunities for recreation. Controlling erosion on sloping lands and protecting lowlands from stream overflow are the principal concerns of management.

Elevation and Topography

Elevation ranges from 200m (655ft) on the valley floors to 400m (1,300ft) on the highest ridges. The sloping to hilly uplands are dissected by both large and small tributaries of the Mississippi River. Bottom land along all streams is narrow. Some ridge tops are broad and have undulating slopes. Local relief is mainly several meters to several tens of meters.

Climate

Average annual precipitation is from 750 to 900mm (30-35in). Two-thirds or more of the precipitation falls during the freeze-free period. Average annual temperature is 7 to 10°C (45-50°F). Average freeze-free period is 140 to 160 days.

Water

In most years the moderate precipitation is adequate for crops and forage, but in years of little or no precipitation, yields on thin soils over bedrock are reduced. Ground water is abundant in outwash deposits in the valleys, but the amount varies on the uplands. The supply of ground water in areas underlain by sandstone and limestone generally is moderate. The many springs, streams, and farm ponds are additional sources of water.

Soils

Most of the soils are Udalfs. They are moderately deep and medium textured. These soils have a mesic temperature regime, an udic moisture regime, and mixed mineralogy. Well drained Hapludalfs (Fayette, Dubuque, Seaton, Gale, Nordness, and Norden series) that formed in a loess mantle over bedrock or in glacial till are dominant. Nearly level to gently sloping Argiudolls (Tama,

Dodgeville, Richwood, and Dakota series) and Hapludolls (Muscatine series) are on benches and broad ridgetops. Hapludolls (Frontenac, Brodale and Bellechester series) are on steep slopes bordering the major valleys. Well drained Udifluvents (Dorchester, Chasenburg, and Arenzville series) are along stream bottoms. Quartzipsamments (Boone series) are on steep slopes, and nearly level Udipsamments (Plainfield and Gotham series) are on stream benches. Steep, stony, and rocky soils are also common in the area.

Appendix C

Sample County Agricultural Histories

These brief accounts condense information from Censuses of Agriculture, soil and erosion surveys, and other documents generally dated for the period 1925-1935; but also from some more recent Censuses of Agriculture and of Population as sources of current income data. Some observations are from soil surveys for other counties in MLRA 105, including nearby Dubuque and Clinton Counties in Iowa and Trempealeau County in Wisconsin. The principal soil or erosion surveys reviewed include those of Benton and Gray (1925), Brown and Nygard (1936), Edwards with others (1928, 1930), Gray and others (1929), Perfect and Sheetz (1942), and the Coon Valley Project Monograph of the Soil Conservation Service (1939).

Clayton County, Iowa

Pioneer settlement of the Clayton County area began in 1833; the county as such was organized in 1837. The population increased steadily until 1870, and then less rapidly until 1900, when it reached a peak of 27,750. Early farm products, chiefly grain, were shipped by steamboats on the Mississippi River to markets farther south or hauled inland by oxen. In 1930 the population was predominantly rural, when there were 2,990 farms. The total population of Clayton County in 1992 was 18,735, only one-fourth of whom lived on 1,620 farms. In 1992 about 23 percent of the personal income of the employed labor force was derived from farming or forest-related enterprises.

Many of the early settlers located their farms on the timbered lands that were easily cleared and cultivated, as the equipment needed to break the tough prairie sod was not available. However, the prairie soils were soon recognized as superior to the timbered soils and large areas were broken and farmed.

Early farming largely depended on growing wheat as the major crop. When corn varieties were found that would do well in local climates, the acreage of corn increased rapidly. The area in wheat decreased sharply after 1880 and corn became the major crop. Oats then replaced wheat as a major crop. Another factor in this change was the transition to a more market-oriented agriculture from small subsistence farming, even with animal power remaining important.

In the years between 1925 and 1935, the type of agriculture in Clayton County consisted of general farming, including the raising and feeding of hogs, cattle, and sheep; considerable dairying; and the growing of corn, small grains, and hay crops. Clover and timothy were the chief hay crops, and nearly all hay was consumed on the farms where grown. Hog raising was the most important livestock industry, followed by dairying.

The Censuses of Agriculture for 1925, 1930, 1935, and 1992 collectively provide a good picture of the kind of agriculture prevailing in the base year 1930, compared with 1992. In 1930 nearly 40 percent of the harvested cropland land was in row crops, with 86.4 thousand acres of corn accounting for 95 percent of all row crops and for over 35 percent of all crops harvested, including hay. Vegetables and Irish potatoes were other important row crops. They were grown primarily for home consumption.

By 1992 nearly 190 thousand acres were in row crops like corn and soybeans, This was almost double the 1930 acreage in corn, and accounted for over 70 percent of the cropland harvested, compared with the 40 percent in 1930. The relatively few soybeans grown in 1930 were essentially used as forage.

Oats were the leading close-grown or small grain in 1930 (64.6 thousand acres), followed by barley (9.2 thousand acres). By 1992 the area in oats had fallen to 14.5 thousand acres, but oats were still the leading small grain grown in the county. There were only 1,300 acres of wheat in 1930 as wheat had already become a minor crop compared with its early years in the area. In 1992 only 175 acres of wheat were reported for the entire county. More on the decline of wheat growing is in the histories for other counties in the region.

Along with the large increase in corn acreage since 1930, yields have increased dramatically owing to the development of improved hybrid varieties and better control of insect and disease problems. Corn yields averaged only about 40 bu/ac from 1930-35 as indicated in early Iowa crop reports (table A-5). The 1987-92 average computed from the Census of Agriculture was over 130 bu/ac. Oat yields also averaged 40/bu/ac from 1930-35, but now run about 65 bu/ac.

Crop yields in themselves influence soil erosion, because they determine the amount of protective crop residues that can be left on the surface or turned under to replenish soil organic matter. Also, a relatively dense protective canopy during the growing season not only indicates good yield prospects but also reduces the erosive impact of intense rains.

The area in hay crops and the frequency of meadow in crop rotations have a major influence on average annual soil erosion losses. In Clayton County in 1930 roughly 53.4 thousand acres or 25 percent of the cultivatable cropland was in rotation meadow, averaging about one acre for each 3 acres in row crops or small grains. Another 17 thousand acres were in other hay-type crops, giving a total for hay of 70,000 acres. In 1992 there were also about 70 thousand acres of hay cut, of which 55 thousand acres or close to 80 percent was alfalfa meadow in various rotations. While alfalfa currently appears to be the hay of choice, the leading hays in 1930 were various clovers and timothy. Alfalfa in rotation or otherwise accounted for less than 3 percent of all hay harvested. In 1930 rotation meadow in the general area consisted mostly of clover or clover/timothy mixes, legume and grass seed crops, and some annual legumes like soybeans and cowpeas harvested for feed.

Houston County, Minnesota

This area was first settled in 1848. Before 1854 Houston County was part of Fillmore County, and was named for General Sam Houston. In a few years as in other surrounding areas the early settlers became almost entirely wheat farmers, owing to the gradual westward movement of wheat farming. The Civil War greatly stimulated wheat production. After that War large areas of land farther west were opened for wheat and prices fell. This, combined with decreased yields from

insects and diseases, caused wheat to become a minor crop in Houston and other counties in the Northern Mississippi region.

In 1930 there were 1,910 farms in Houston County. The total population was 13,345; it was nearly all rural as no town had more than 2,500 people. In 1992 the total population was 18,790 persons; only about 2,800 or 15 percent lived on 975 farms. Farm employment accounted for 13.5 percent of all personal income earned in the county.

In the 1930's the usual Corn Belt crops of corn, oats, barley and clover and timothy hay were grown. Virtually all the crops and hay were fed on the farms to dairy cattle and hogs. Some tobacco, flaxseed and fruits were sold for cash.

As in Clayton County about 25 percent of the cultivatable cropland was in rotation meadow in 1930, but there were another 43.5 thousand acres in non-rotation hayland, giving 65.4 thousand acres in grass or legume crops, or about 45 percent of all cropland harvested. Only 3.6 thousand acres were in alfalfa meadow in 1930, contrasted with 39 thousand acres in 1992.

The grain crops in 1930 were about equally divided between corn at 35.2 thousand acres and small grains at 35.8 thousand acres, mostly oats and barley. By 1992 there were 65.2 thousand acres in corn or soybeans alone. Oats and other small grains totaled only 8.5 thousand acres. Corn yields in 1987-92 averaged 125 bu/ac, compared with the 40 bu/ac average yield recorded by the Minnesota Crop Reporting Service for the years 1930-35 (table A-5).

Winona County, Minnesota

The first substantial settlement of Winona County began soon after 1851, when a large part of southern Minnesota was ceded to the United States by Indians. Winona County was formed in 1854 from part of Fillmore County. By 1868 the city of Winona was rated as the fourth largest shipping center in the United States, specializing in wheat and lumber shipment to southern and eastern markets.

When farming began, general farm crops and vegetables were grown, but they were quickly surpassed by wheat. Wheat production then reached its maximum around 1877. Thereafter it declined and was displaced by malting barley and oats. Settlement in the county peaked about 1880, when there were 2,394 farms and 65.5 percent of the farmland had been improved. In 1930 there were 2,060 farms and the county's rural population was 10,409, down from its 1880 peak of 15,593. Including major towns like Winona, the county's total population in 1930 was around 35,000 people. In 1992 the county had 47,769 residents, of whom only 3,800 lived on 1,090 farms. Those engaged in farming in 1992 earned about 7 percent of the personal income of county residents.

The Cooperative Creamery Movement, started around 1897, stimulated dairying in Winona County as other counties in the region. Dairying became the major farm enterprise, with most other farm operations supporting or built around it.

The cropping patterns for Winona and Houston Counties, Minnesota in 1930 were somewhat dissimilar. Both had around 36 thousand acres in corn, but Winona County had over twice as much land in small grains, with oats at 35.4 thousand and barley at 26.3 thousand acres. Row crops, the small grains or rotation meadow accounted for 80 percent of all cropland harvested, with rotation meadow accounting for 23 percent of the cultivatable cropland. Rotation meadow and other grass/legume hays represented nearly 35 percent of all harvested cropland in Winona County, about the same percentage as in Clayton County, Iowa, but lower than the 47 percent for Houston County.

Average corn yields in Winona County for the years 1930-35 were 35 bu/ac; oats averaged 35 bu/ac. These yields were slightly below those for other sample counties (Table A-5). Corn yields for the two most recent Census years 1987 and 1992 averaged 120 bu/ac. The average oat yield was 60 bu/ac.

Crawford County, Wisconsin

The first settlement in Crawford County dates back to 1781, near what is now the city of Prairie du Chein. In 1930 the population of Crawford County was about 16,800 and there were 1,915 farms. The 1992 population was virtually at the same level--at 16,014, but only 16 percent lived on farms. By 1992 the number of farms had fallen to 975. Farmers earned 17 percent of the personal income received in the county in 1992.

In the first few decades following settlement, agriculture was confined mostly to the production of subsistence crops for the household and wheat for market. Livestock were raised for home consumption but as transportation facilities improved livestock became an important source of farm income. By 1900 they had become more dominant than grain production. With livestock increases, especially in dairying, more attention was given to forage crops, especially red clover and alfalfa.

In Crawford County tobacco became a well established cash crop. It had shown a continuous increase between 1880 and 1930. There were 2,400 acres in tobacco in 1930, but farmers reported only 540 acres in the 1992 Census of Agriculture.

Rotation meadow in 1930 occupied about 25 percent of the cultivatable cropland in Crawford County. It and other hay crops accounted for nearly 50 percent of all harvested crops. In 1992 rotation meadow totaled 41 thousand acres, nearly all of which was alfalfa. This was slightly more than the combined area in corn, soybeans, and the small grains.

Owing to some extensive areas of fertile valley soils, crop yields in Crawford County in the 1930-35 period appeared to range somewhat higher than in some neighboring sample counties. The 1930 Crawford County Soil Survey cited expected corn yields on the Bertrand and Ray silt loams ranging up to 70 bu/ac; the overall county average for corn was 50 bu/ac (table A-5). Oats, normally grown more often on the less productive soils, averaged 40 bu/ac. Based on the same Soil Survey and the 1930 Census, tobacco yields ran about 1,400 lbs/ac. Yields averaged for the Census years 1987 and 1992 were 110 bu/ac for corn, 55 bu/ac for oats and about 1,525 lbs/ac for tobacco.

Vernon County, Wisconsin

Permanent settlement of Vernon County dates back to 1844. Before 1851 Vernon County was part of Crawford County, Wisconsin. In 1855 the County's population was 4,800 and in 1930 was about 28,500, when there were 4,015 farms. The county's population in 1992 was 26,007, with around 6,000 living on 2,060 farms and earning 22 percent of the personal income.

In the early years wheat was the main cash crop, and sheep raising soon developed beyond meeting local needs. Also, tobacco became an important cash crop. It increased steadily up to about 1920 and then stabilized. At first beef production was the leading livestock enterprise but by 1910 was surpassed by dairying.

In 1930 the agriculture of Vernon County was dominated by dairying, supplemented by hog and sheep production and to a lesser extent by cash crops like corn and tobacco. The same is true today, except that sheep and wool production have decreased sharply.

Nearly 9,000 acres were in tobacco in 1930; this had declined to about 2,500 acres by 1992. About 31 thousand acres were in corn in 1930; this had increased to 53 thousand acres by 1992. As in neighboring counties, the area in small grains has decreased significantly, falling in Vernon County from 47.8 thousand acres in 1930 down to about 7 thousand acres in 1992, and the small grains remaining were nearly all in oats. Corn yields around the year 1930 apparently averaged 45 bu/ac according to the 1928 Soil Survey for Vernon County (table A-5). Yields now average 115 bu/ac according to the 1987 and 1992 Censuses of Agriculture. The average yield for oats in 1930 was 40 bu/ac; this had increased to an average of 55 bu/ac for the years 1987 and 1992. In 1992 tobacco yields were about 1,600 lbs/ac, compared with 1,200 lbs/ac in 1930.

In 1930 about 20 percent (23.6 thousand acres) of the cultivatable cropland in Vernon County was in rotation meadow crops, but another 77.3 thousand acres were in nonrotation hay. These crops accounted for over 50 percent of all cropland harvested. Significantly, by 1992 the area in tame hay, nearly all of which was alfalfa, had increased to 72 thousand acres. This was more than the combined area in corn, soybeans, and the small grains.

Appendix D

Other Major Land Resource Areas for Study

Area 1: MLRA's in Washington State

07 Columbia Basin

08 Columbia Plateau

09 Palouse and Nez Perce Prairies

Severe wind erosion in this area was noted in the Reconnaissance Erosion Survey (RES). The area has extensive highly erodible land and an important source of sediment. Much of the highly erodible land is in wheat. Enrollment in the Conservation Reserve Program (CRP) is substantial.

Area 2: MLRA's in Montana, North Dakota, South Dakota

52 Brown Glaciated Plain

53A, 53B, 53C Dark Brown Glaciated Plains

54 Rolling Soft Shale Plains

55 Black Glaciated Plains

Widespread wind erosion was noted in the Reconnaissance Erosion Survey of 1934. Wind erosion was severe in pockets throughout North Dakota, with a few areas of sheet/gully erosion. There is a high concentration of highly erodible cropland in northern Montana, the so-called winter wheat Triangle. The area is not too important as a source of sediment, probably because of wind rather than sheet erosion being dominant. In 1992 there was a high concentration of land in the

Conservation Reserve Program (CRP), which is concerned primarily with removing highly erodible land from production. Irrigation is also important and widely scattered.

Note: North Dakota is almost entirely within MLRA's 53, 54 and 55. Using the entire State as a study area would take advantage of State-level data on conservation practices and investments being developed in other RCA studies, including data on watershed programs.

Area 3: MLRA's in Nebraska, Kansas, Oklahoma, Texas and New Mexico, Colorado

71 Central Nebraska Sand Hills

72 Central High Tableland

73 Rolling Plains and Breaks

74 Central Kansas Sandstone Hills

77 Southern High Plains

These areas are characterized by various kinds and degrees of erosion, both water and wind erosion. The areas contain some very concentrations of erodible land, especially in southwest Kansas, west-central Nebraska, the Oklahoma Panhandle and north Texas. A considerable acreage was enrolled in the CRP in 1992. The areas all have a diversified crop and animal agriculture; wheat, corn, sorghum, cotton are all major crops. Irrigation is widespread, from both surface water projects and ground water systems.

Area 4: MLRA in Wisconsin, Minnesota, Iowa and Illinois

105 The Northern Mississippi Valley Loess Hills

(This is the area with which this trial study was concerned)

Area 5: MLRA's in Ohio, Pennsylvania, West Virginia

124 Western Allegheny Plateau

126 Central Allegheny Plateau

Moderate sheet and gully erosion according to the 1934 Reconnaissance Survey. The areas have considerable highly erodible land and are a moderate source of sediment. Corn is the dominant row crop, and is grown on fairly small fields compared to other regions. Livestock are also important.

Area 6: MLRA's in Tennessee, Mississippi, Kentucky

134 Southern Mississippi Valley Silty Uplands

Sheet and gully erosion were moderate in this area according to the Reconnaissance Erosion Survey. Lower reaches of the MLRA appear highly erodible and important contributors of sediment. There is some but not major participation in the CRP. Cotton and soybeans are the major crops, followed by sorghum.

Area 7: MLRA in Alabama, Mississippi, and Arkansas**135 Alabama, Mississippi and Arkansas Blackland Prairie**

Sheet and gully erosion were severe in this area according to the Reconnaissance Erosion Survey and other studies. The area has a considerable acreage of highly erodible land and is also an important source of sediment. Cotton and soybeans are the major crops.

This area is also said by Trimble to warrant special interest because of devastating past erosion (1985,p.77).