

The national erosion inventory of the Soil Conservation Service, US Department of Agriculture, 1977-1979

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ABSTRACT The Soil Conservation Service, US Department of Agriculture, has completed the second phase of a national erosion inventory designed to provide data reliable to the state level that illuminate the relative importance of various erosion processes and origins. Phase I dealt with sheet and rill erosion on cropland, range, pasture, and forest lands and was completed in 1977. Phase II inventoried erosion rates on streambanks, gullies, roads, and construction areas. Data collection was completed in October 1979. The data are from some 72 500 randomly selected primary sample units on non-federal land in all states except Alaska and including Puerto Rico.

L'inventaire national de l'érosion du Service de Conservation des Sols, US Department of Agriculture, 1977-1979

RESUME Le Service de Conservation des Sols (SCS), au Département de l'Agriculture achève la seconde phase de l'inventaire national sur l'érosion, conçu pour fournir des données sûres aux Etats. Ces données mettent en évidence l'importance relative des divers processus d'érosion et de leurs origines. La phase I, achevée en 1977, a traité de l'érosion des nappes et de l'érosion en rigoles sur les terres en culture, les champs, les pâturages et les forêts. La phase II a inventorié les taux de l'érosion le long des rives, des ravins, des routes et terrains en construction. La collecte des données a été achevée en octobre 1979. Les données ont été prélevées sur environ 72 500 parcelles unitaires d'échantillonnage prises au hasard sur des terrains non fédéraux dans chaque Etat sauf l'Alaska et y compris Porto Rico.

THE NATIONAL EROSION INVENTORY

Total national erosion on nonfederal land is estimated at about 4.8×10^9 Mg annually. Percentages of this total, by land type, are as follows:

<i>Phase I</i>		<i>Phase II</i>	
Cropland	37.6%	Streambanks	10.6%
Range	26.5%	Gullies	5.7%
Forest	8.3%	Roads	3.2%
Pasture	6.6%	Construction	1.5%
TOTAL	79%	TOTAL	21%

The tabulated Phase II data are presented by region and state. The Phase I erosion data were previously issued by the Soil Conservation Service (SCS) of the US Department of Agriculture (USDA). These data generally are from a 0.6% sample area. The erosion rate estimates can help in directing efforts and funds to those sources where erosion control would be the most cost effective. This applies to sediment control for water quality, too.

In 1977 the SCS initiated a national erosion inventory of nonfederal land as a part of the National Resource Inventories. The first phase, completed in 1977, inventoried the sheet and rill erosion occurring on nonfederal cropland, pasture, range and forest from water. This amounted to 3 760 961 Mg per year. At the same time we planned a second phase of the inventory to get an indication of the magnitude of erosion occurring on streambanks, gullies, roads and roadsides, and construction areas. This had not been done before. The SCS Administrator authorized Phase II to be done over a 2 year period with completion by October 1979. The sedimentation geologists from the four SCS technical service centres (TSC) and the National Office met in Washington in June 1977. We planned a training session in each TSC area for the people who would be responsible for the Phase II inventory in each state. Then each state office held a training session for those who would be gathering the Phase II erosion information. The same 72 500 primary sample units (PSU's) used in Phase I were visited in Phase II. These ranged in size from 16 to 259 ha, but most were 40 or 65 ha. They represent non-federal land in all states but Alaska and include Puerto Rico and the US Virgin Islands. In Phase I, three points in each PSU were visited to obtain the values to calculate the sheet and rill erosion with Wischmeier & Smith's universal soil loss equation. More time was needed in Phase II to cover an entire PSU to identify the extent and estimated rate of erosion on streambanks, gullies, roads and construction areas. An entire PSU had to be traversed. Only construction areas of 0.4 ha or greater were inventoried. We estimated as a national average that a man could do two PSU's per day depending, of course, on the amount of travel required. This turned out to be a reasonable estimate.

At the training sessions guidance was given as to what clues to look for to help in estimating the rate of annual lateral recession of eroding banks. Such things as the exposed roots of trees can help in estimating average rates of bank recession. Posts exposed along roads can indicate erosion rates if the period of installation can be determined. Each state office issued guidance for estimating erosion rates in line with the broad guidance provided nationally. For example, the following criteria were used in training in the state of Kentucky:

Table 1 SCS national erosion inventory tables, November 1980, from data collected 1978-1979

SCS national erosion inventory totals for 610 million ha of nonfederal land

PHASE I	CROP	PASTURE	RANGE	FOREST	= TOTAL
1000 Mg year ⁻¹	1 786 676	314 192	1 263 218	396 875	3 760 961
%	37.6	6.6	26.5	8.3	79.0
PHASE II	STREAMBANKS	GULLIES	ROADS	CONSTRUCTION	= TOTAL
1000 Mg year ⁻¹	501 763	270 619	153 003	72 529	997 914
%	10.6	5.7	3.2	1.5	21.0
GRAND TOTAL					= 4 758 875

Estimated average annual erosion on streambanks, gullies, roads and roadsides, and construction sites on nonfederal land, by state (1000 Mg year⁻¹)

State	Streams	Gullies	Roads	Construction sites
<i>Northeastern region</i>				
Connecticut	121	52	226	619
Delaware	174	18	4	34
Maine	970	87	975	864
Maryland	1 232	158	279	731
Massachusetts	127	24	230	16
New Hampshire	140	134	771	74
New Jersey	516	21	143	122
New York	10 812	2 142	5 551	984
Pennsylvania	6 718	1 047	2 609	2 836
Rhode Island	6	—	16	17
Virginia	3 669	236	3 370	1 457
Vermont	465	70	1 564	15
West Virginia	4 593	457	16 646	1 119
Caribbean	177	28	21	—
Total	29 720	4 474	32 405	8 888
			Regional total =	75 487
<i>Midwestern region</i>				
Illinois	14 981	4 281	777	790
Indiana	13 681	590	189	839
Iowa	18 468	10 939	992	1 014
Kansas	20 608	11 393	1 581	635
Michigan	2 007	183	863	427
Minnesota	5 418	5 309	1 703	2 017
Missouri	10 088	2 623	2 377	1 105
Nebraska	17 743	20 667	2 495	1 516
North Dakota	9 399	3 383	331	4
Ohio	10 958	1 883	1 655	2 725
South Dakota	40 529	30 093	295	118
Wisconsin	2 339	2 056	962	1 218
Total	166 220	93 400	14 220	12 408
			Regional total =	286 248
<i>Western region</i>				
Arizona	4 458	24 769	3 459	1 126
California	49 354	16 676	19 558	2 191
Colorado	15 916	8 788	1 028	99
Hawaii	20	216	28	120
Idaho	3 843	883	3 256	1 537
Montana	12 123	2 996	545	77
Nevada	2 902	1 264	80	99
New Mexico	20 543	10 856	20 643	596
Oregon	2 936	873	1 503	298
Utah	3 172	830	245	43

Table 1 (cont.)

State	Streams	Gullies	Roads	Construction sites
Washington	14 316	5 281	2 674	151
Wyoming	12 431	10 089	680	3
Total	142 016	83 521	53 701	6 340
			Regional total = 285 578	
<i>Southern region</i>				
Alabama	5 096	8 948	11 273	12 385
Arkansas	18 832	777	7 032	2 409
Florida	5 460	415	2 654	482
Georgia	3 753	617	5 127	3 463
Kentucky	10 015	1 563	2 372	2 694
Louisiana	8 761	1 018	1 583	4 600
Mississippi	10 458	3 485	2 900	2 055
North Carolina	6 578	617	5 370	6 055
Oklahoma	27 166	16 373	3 101	3 838
South Carolina	3 703	1 178	5 045	725
Tennessee	8 388	5 947	2 156	2 976
Texas	55 600	48 285	4 063	3 201
Total	163 810	89 223	52 676	44 883
			Regional total = 350 592	

Clues for identifying streambank erosion

Slight There is a bare bank, but lateral recession of the bank is not very obvious. It would be hard to measure over a period of 1-2 years.

Moderate This category of streambank erosion is characterized by active eroding banks. There are many exposed tree roots, fallen trees, and cave-ins.

Severe Severe streambank erosion is characterized by meandering streams that have changed their courses within the last 2-3 years. There are massive washouts. Probably the most characteristic thing is the change in the stream course itself.

Estimates of streambank erosion:

	<i>Annual lateral recession</i>	<i>Average</i>
Slight	0.6-3 cm (0.02-0.10 ft)	1.5 cm (0.05 ft)
Moderate	3-6 cm (0.11-0.2 ft)	4.6 cm (0.15 ft)
Severe	>6 cm (>0.20 ft)	7.6 cm (0.25+ ft)

The data collected on work sheets were reviewed in each SCS state office and forwarded to the Iowa Statistical Laboratory, Iowa State University, at Ames, Iowa. There they were studied, and if there were no questions, they were stored in their computer, and tables of erosion by state, region and nation were then printed (Table 1).

CONCLUSION

The SCS national erosion inventory provides a better perspective of the relative importance of erosion occurring in the US than we have had before. Some 38% of the total erosion estimated to be

occurring is on cropland; then comes rangeland with 26%; stream-bank erosion with 11%; followed by forest land, 8%; pastureland, 7%; gullying, which includes streambed erosion, 6%; roads and roadsides, 3%; and least important, although locally high, is construction site erosion, 1.5%. If one is concerned about sediment yield, then the relative importance changes; perhaps 20-30% of the sediment from sheet and rill erosion compared to 80-90% or more of that from channel-type erosion may reach the downstream area. A final note of caution, since these data are considered reliable only at state level or for major river basins, they are not suitable for localized application.

