mainline levees. He and Potter suggested a general division of labor which would give the Corps responsibility for all mainline levee work along the Mississippi and Missouri rivers, as well as the lower reaches of the Grand River. SCS would bear responsibility for repairs in the rest of the state. Such a division of labor did not exactly follow the four hundred square mile rule, but had the virtue of simplicity.

In early September, SCS distributed a press release which clarified its policy: "While the Soil Conservation Service will not repair levees in the floodplains of the Missouri, Mississippi, and lower Grand rivers, it will be responsible for levee repairs along all tributaries of those three rivers, as well as the Grand River itself upstream of U.S. Therefore, levees along the largest rivers remained the exclusive Highway 36." responsibility of the Corps. This situation soon changed as SCS suggested that it should repair some levees south of Route 36 which were more logically parts of the levee system above the dividing line. Then, in early 1994, Congress' supplemental appropriation provided the authority and funds for SCS to make repairs in the major river bottoms to levees rejected by the Corps of Engineers. As was the case in other flood states, however, the number of levees that met the criteria turned out to be fewer than expected and only a handful were repaired by SCS.<sup>286</sup> Overall, however, through the efforts of the Corps, SCS, levee or drainage districts, and private citizens, most levees were restored to their pre-flood condition and location, despite recommendations made as far back as 1944 that levees be built as least fifteen hundred feet from the river.287

Sand deposits after floods along the Missouri River became another major problem for farmers and SCS. The sand was scoured from the river bottom and deposited on cropland in the floodplain as the water spread, slowed, then retreated to its original banks. The sand made the land useless for agriculture, a situation that was not unique to 1993. Rufus Terral wrote that after the 1935 floods, some farms were stripped of soil and others received sand and gravel deposits from two to twelve feet deep. The special plowing equipment needed to cut through this material to a depth of six feet and turn the soil underneath required five tractors in the 1930's.<sup>288</sup> In early September of 1993, Missouri reported that many areas were covered with from one to five feet of sand.<sup>289</sup> Even the national press discussed the problem. On September 13 an Associated Press report from Iowa highlighted the problems of sand and silt on farmland. About ten million acres of farmland was flooded--an area twice the size of New Jersey-causing an

<sup>&</sup>lt;sup>286</sup> See the "Levees" section for details on the 1994 repairs.

<sup>&</sup>lt;sup>287</sup> For more information on levee plans and floodplain management in Missouri, see Keith Schneider,

<sup>&</sup>quot;Legacy of '93 Flood: Sand, Sand, and More Sand," New York Times, June 9, 1994.

<sup>&</sup>lt;sup>288</sup> Terral, Missouri Valley, 92-94.

<sup>&</sup>lt;sup>289</sup> Lloyd E. Wright, Director, Watershed Projects Division, to Leonard P. Mandrgoc, USDA Emergency Coordinator, Report #38, September 7, 1993.

estimate \$5 billion in crop damage. An agricultural engineer in Iowa estimated that for every acre with two feet of sand, six acres were required to work it into the soil in order to partially restore the land's productivity. This work was delayed time and again due to rains.<sup>290</sup>

Even before the water had receded enough for EWP work to begin in earnest, the Service's response to sand deposits combined a variety of disciplines. For example, in August the staff of the state office combined a variety of technologies in order to provide statistical data on flood damage. By analyzing colors and textures on an aerial video of the Missouri River floodplain shot by the FWS, the Resources Information Management Section under Bob Ball determined the rough percentage of cropland covered by sand and estimated the depth of that sand. Terry Barney of this section and Ken Vogt of the soils staff performed much of this analysis. (The attached map details this phenomena near Hartsburg, a small town near Missouri's state capital of Jefferson City.) They then extrapolated this data and were able to make estimates as to the total areas covered by sand as well as its depth throughout the floodplain, which is the heartland of Missouri's agriculture. By combining this data with information from the soils staff, they determined the depth of plowing needed at each depth of sand to at least partially restore soil productivity. The data was then correlated with price estimates from local contractors for deep plowing or sand removal work in order to give people an idea of the great expense and effort that lay ahead.<sup>291</sup> Finally, the public affairs staff made this data widely available to the public.<sup>292</sup>

The 1993 flood presented SCS soils experts with other vexing problems. Besides the problem of the amount of sand was its varying texture and strata. Bruce Thompson, state soil scientist, pointed out that the two peaks of the flood left two distinct layers in many places. The first flooding in June and July was relatively minor. The water generally moved slower and thus was able to move only smaller particles of sand onto farmland. These particles could be plowed into the soil with relative ease. The second high water in August and September was more devastating. It blew out many levees. The faster moving, more forceful water carried heavier sand particles which were placed on top of the first layer, thus creating a "sandwich" of coarse sand or gravel, fine sand, and finally soil. This phenomena was especially prevalent near major ruptures in levee Staff at the state and local level stressed that farmers were eager to get systems. information on restoring soil fertility as quickly as possible in order to reserve the special heavy plowing equipment that many would require.

<sup>&</sup>lt;sup>290</sup> "Farmers Eye Post-Flood Season," AP newswire, September 13, 1993.

<sup>&</sup>lt;sup>291</sup> The price data came from an agricultural extension engineer at the University of Missouri.

<sup>&</sup>lt;sup>292</sup> Missouri's sand and levees problems were the focus of a front-page article in the *New York Times* on June 9, 1994. The newspaper also used SCS's maps.



As flood water went down, parts of the Midwest looked like a desert. Here, SCS employee Bruce Thompson walks across sand deposited by flood waters in Missouri. Photo by Charles Rahm, SCS-Missouri.

An article in September's *Farm Journal* discussed various soil problems due to the flooding. One major problem was that the water broke down the soil structure and made it very susceptible to compaction by farm equipment. Sometimes, the silt cut off air from the soil, thus retarding biological activity--the fallow syndrome. Water also washed nitrogen out of the soil. Cover crops were vital for protecting the soil and restoring its fertility. The article stressed that farmers must be patient and let their fields drain as much as possible before moving equipment onto them.<sup>293</sup> Allen Green, assistant state conservationist in Missouri, stated that it would cost at least \$300 million to reclaim sand-covered land. Restoring the land to its previous fertility level would require an additional \$81 million.<sup>294</sup>

Explaining the EWP program, levee policies, and sand deposits required a cooperative approach with other federal agencies, state government, and SCS national headquarters. For example, in early October, SCS, ASCS, and Corps personnel participated in a series

<sup>&</sup>lt;sup>293</sup> Darrell Smith, "When the Water Goes Down," Farm Journal (September 1993): 16-17.

<sup>&</sup>lt;sup>294</sup> Bill Graham, "Smothered Land Covers the Future," Kansas City Star, October 10, 1993.

of meetings in nine locations across Missouri in order to answer questions from the public, press, and politicians.<sup>295</sup> SCS also exchanged information with state agencies, especially the Department of Natural Resources and the Department of Agriculture. In October, SCS and the University Extension from the University of Missouri and Lincoln University cooperated to produce a fact sheet which helped farmers assess the costs and difficulties of reclaiming their farmland. It included detailed information developed by SCS on incorporating sand into the soil in order to restore fertility.

State staff kept those in Washington informed of obstacles and progress in repair work, a task that involves both reporting statistical data and trying to draw attention to the unique needs of each their state. In late October of 1993, Russ Mills, state conservationist for Missouri, along with deputy director of the Missouri Department of Agriculture, Kyle Vickers, a wetlands specialist from the Missouri Department of Conservation, Steve Young, and a farmer from Ray County, Bob Vandiver, held a National Headquarters Seminar for USDA employees. Vandiver's farm, in the Missouri Valley Drainage and Levee District, was damaged due to a thirty-nine hundred-foot levee breach. These men focused on the vast problems associated with sand deposits in the Missouri River floodplain. The high velocity of the water in this flood picked up and spread relatively heavy materials far from the river, especially in areas downstream from bridges, which tended to constrict and speed the flow of water. The water then spread out across the floodplain, slowed, and deposited sand or gravel. Mills estimated that it could cost up to \$4,000 to remove one foot of sand from one acre of farmland. He and Vandiver stressed the need to provide clear policies on wetlands and levee repairs quickly so that farmers could make their decisions on next year's planting.

Missouri landowners were eager to participate in the EWRP program.<sup>296</sup> This state had the highest number of sign-ups and acres enrolled. As was the case in Iowa, SCS worked closely with the state government. The Department of Conservation offered to provide an additional \$200 to \$300 per acre in order to purchase title to the land after SCS had obtained the easement. Thus, landowners could free themselves from any tax obligation for the land. Both the Fish and Wildlife Service and the Nature Conservancy sought to participate.

The scope, severity, and longevity of this disaster were unprecedented. Within that context, two problems plagued SCS's EWP effort in Missouri. First, more than in other flood states, continued heavy rains and slowly receding water hampered damage evaluations and repair work in the fall of 1993. A related issue was the lack of a clear policy from Washington on wetlands and levee repairs. Time and again, staff at the state

<sup>&</sup>lt;sup>295</sup> The meetings were organized by the state extension service.

<sup>&</sup>lt;sup>296</sup> See the wetlands section of this history for statistics on the 1993 and 1994 EWRP sign-ups.

and local level emphasized that farmers wanted concrete information on alternatives to structural repairs or cropland restoration. For example, those involved with the pilot WRP program in Missouri stressed that farmers had shown a great deal of interest in the 1992 program and were even more eager to participate in the wake of the flood. The problem was not simply in gathering technical or field data, although high water delayed this task, but also in obtaining overall guidance on policies.

### Wisconsin and Minnesota

Although their agricultural output was devastated by the disaster of 1993, Wisconsin and Minnesota were the states with the smallest EWP efforts. These two states highlight the limits of the emergency program.

The experience of Wisconsin illustrates the long-term nature of this flood event. For farmers, this disaster began with the cool and wet weather in September of 1992. The ground was saturated even before the torrential rains of the spring and summer of 1993. Most damage was in the southwest part of the state. The Badger State suffered approximately \$800 million in agriculture-related damages due to the flood.<sup>297</sup> According to the Service in Wisconsin, over eight hundred thousand acres of agricultural land (seven percent of the state total) suffered erosion of over ten tons per acre due to the extended rains on saturated soils which led to the flooding of the main rivers. It was expected to cost \$10.8 million to implement the land treatment practices necessary to protect the remaining topsoil and restore productivity to the land. Further, the floods delayed the construction of conservation measures required to meet the conservation compliance provisions of the Food Security Act. Nevertheless, Wisconsin SCS-ers reported that conservation practices already in place, such as contour strip cropping and conservation tillage, reduced the amount of soil washed away by up to five hundred percent.<sup>298</sup>

On July 18, a particularly severe hydrologic event occurred in the Baraboo area.<sup>299</sup> By late August, a special field office had been established in Baraboo to service EWP sites. SCS worked with FEMA, local officials, and the Wisconsin Department of Natural Resources to facilitate repair work. At that time, fourteen damage sites were feasible for EWP (that is, they were feasible from an engineering and economic point of view).<sup>300</sup> By mid-1994, it became clear that Wisconsin would have one of the smallest EWP efforts--the state office handled only twenty-three requests for assistance. Of the eighteen requests which were eligible for the emergency program, eight were for debris

<sup>&</sup>lt;sup>297</sup> For a detailed account of this state's experience with the floods, see Gary Heinrichs, ed., *The Floods* of 1993: *The Wisconsin Experience* (Bureau of Water Regulation and Zoning, Wisconsin Department of Natural Resources, 1994).

<sup>&</sup>lt;sup>298</sup> Karl F. Otte, Acting Director, Watershed Projects Division, to Leonard P. Mandrgoc, USDA
Emergency Coordinator, Office of the Assistant Secretary for Administration, Report #8, July 12, 1993.
<sup>299</sup> Baraboo is both a town and a tributary to the Wisconsin River situated to the north of Madison.
<sup>300</sup> Lloyd E. Wright, Director, Watershed Projects Division, to Leonard P. Mandrgoc, USDA
Emergency Coordinator, Office of the Assistant Secretary for Administration, Report #36, August 30, 1993.

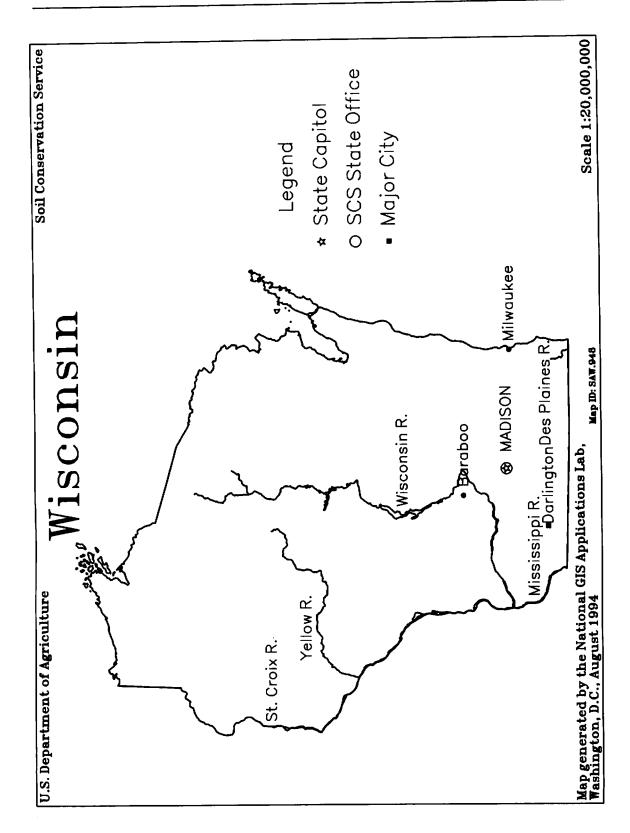


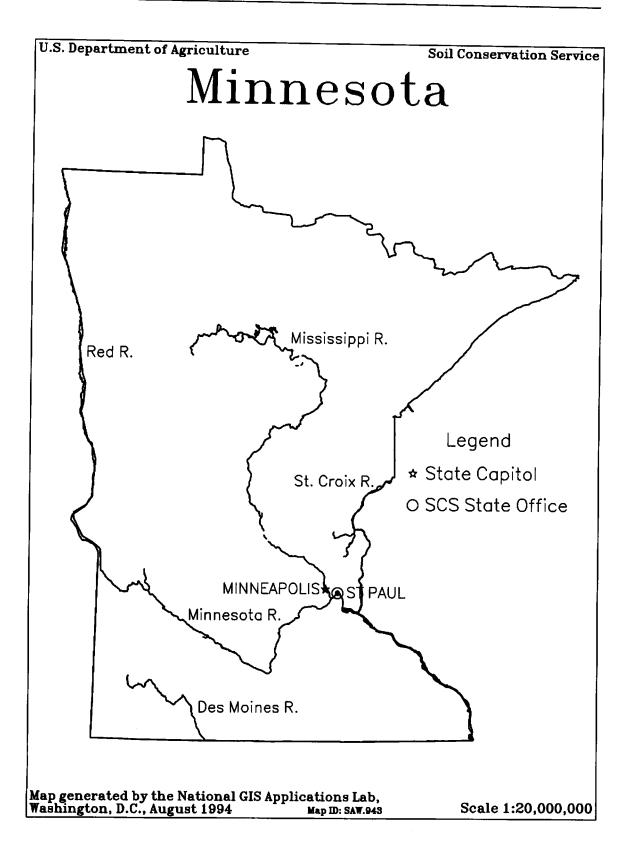
SCS promotes crop residue management in order to limit erosion and run-off of agricultural chemicals and fertilizers. A Minnesota farmer plants in the previous year's corn residue. He is also applying fertilizer and herbicide. SCS photo file.

removal and ten for erosion control. In Wisconsin, the Corps did a few levee repairs; SCS did none. As was the case in many of the nine states, the National Guard assisted in the immediate aftermath of the flood by removing debris and opening channels.

Primarily in response to the damages in the Baraboo area, the Service in Wisconsin participated in a variety of inter-agency flood response efforts. On July 30 the Disaster Response Group for Wisconsin met. The group included SCS, FEMA, ASCS, FmHA, the Wisconsin Agricultural Statistical Service, the Department of Trade and Consumer Protection, and the University of Wisconsin Extension. The Service also cooperated with the Corps to produce a flood mitigation plan for Darlington, a town in the southwest part of the state, through the Small Watershed Program.<sup>301</sup>

<sup>&</sup>lt;sup>301</sup> Karl F. Otte, Acting Director, Watershed Projects Division, to Leonard P. Mandrgoc, USDA Emergency Coordinator, Office of the Assistant Secretary for Administration, Report #16, July 22, 1993.





The heavy rains of May marked the start of the great flood of 1993 in Minnesota.<sup>302</sup> For the next four months, the state would be hit by major storms. In Minnesota, some farmers had their crops washed out by heavy rains three times by early July.<sup>303</sup> The most severe damage was in the southwestern part of the state. Due to storms in late July, however, the damage area expanded into the south-central part of the state.<sup>304</sup> A total of fifty-seven counties were included in President Clinton's disaster declaration. As was the case in Wisconsin, agriculture was devastated in the state: corn production plummeted fifty-six percent in 1993.

The Soil Conservation Service played an important role in coordinating flood recovery work in Minnesota. On July 13, 1993, FEMA held a meeting with SCS and other agencies in order to prepare to respond to the flood. SCS staff chaired the Erosion-Sediment/Agriculture sub-group of the Minnesota Flood Recovery Team. The group included ASCS, FmHA, the Minnesota Board of Water and Soil Resources, the Minnesota Department of Agriculture, and congressional staff. Their goal was to route requests for assistance quickly.<sup>305</sup> The Service in Minnesota received thirty-two requests for assistance after the flood. Of these, sixteen were eligible for the EWP program; thirteen for debris removal from streams and three for erosion control. The total estimated cost for repair contracts was less than one million dollars.

"Flood damage" meant much more than the popular image of raging waters flowing through the floodplain. Furthermore, reducing the reliance upon structures such as levees and removing the human presence from the floodplain will not make the problems and costs of flooding or excess rainfall disappear. A report by the Wisconsin Department of Natural Resource is worth quoting at length:

Perhaps the most misunderstood and least publicized factor in the 1993 floods was antecedent soil moisture....[M]ost media coverage focused on the riverine flooding, flash flooding, dam breaks and levee failures....Raging river, clogged dams, flooded homes and floating cars are more interesting than soil moisture levels, soil type analysis, soil depth to bedrock, and soil drainage patterns.

<sup>&</sup>lt;sup>302</sup> For more information, see *The Great Flood of 1993: The Minnesota Experience*, a report prepared by the Minnesota Department of Public Safety, Division of Emergency Management.

 <sup>&</sup>lt;sup>303</sup> Karl F. Otte, Acting Director, Watershed Projects Division, to Leonard P. Mandrgoc, USDA
 Emergency Coordinator, Office of the Assistant Secretary for Administration, Report #4, July 6, 1993.
 <sup>304</sup> Karl F. Otte, Acting Director, Watershed Projects Division, to Leonard P. Mandrgoc, USDA
 Emergency Coordinator, Office of the Assistant Secretary for Administration, Report #26, August 5, 1993.

<sup>&</sup>lt;sup>305</sup> Lloyd E. Wright, Director, Watershed Projects Division, to Leonard P. Mandrgoc, USDA Emergency Coordinator, Office of the Assistant Secretary for Administration, Report #40, September 20, 1993.

Investigations by experts in the Scientific Assessment and Strategy Team, data collected by SCS, and anecdotal evidence all suggest that the programs managed by the Service have made important contributions to the management of America's water resources, including flood control and prevention. This was most clear in projects built under the auspices of the Small Watershed Program. The combination of structural measures, such as small dams, and non-structural, like land treatment practices, reduced the local severity of flooding. In light of proposals to cut the Small Watershed Program in the FY 1995 budget, however, the future of these efforts appeared in doubt.<sup>307</sup> Other activities, such as enforcement of the conservation compliance provisions of the 1985 and 1990 farm bills, also helped reduce sediment and slow run-off from fields. This was the sort of "normal" soil and water conservation work to which many SCS employees were eager to return.

The flood response also must be understood in its unique political and economic context. First, the new administration had not selected a Chief for SCS until early 1994, thus reducing the Service's leverage and bargaining power with other federal agencies. This did not help SCS in its discussions with ASCS over the emergency wetlands program. Second, the Re-inventing Government effort, while probably logical and cost-effective in the long run, did make some federal agencies less likely to cooperate with one another. Third, budget constraints and the drive by each agency to prove its worth to the incoming administration drove much of the flood recovery process, or at least the way in which that work was presented to policy makers in Washington.

The story of levee repair and floodplain management revealed a pattern of conflict between two informal coalitions. On one side were experts in the federal bureaucracy, academia, and environmental groups, who sought to create rational and consistent flood recovery and floodplain management policies. On the other side were forces such as farmers and landowners, SCS employees at the state level or below, and elected representatives. They focused on solving specific, concrete problems. The former tended to emphasize making major policy changes while the latter generally wanted to return to the pre-flood conditions. For example, time and again, the internally consistent, well-thought out plans for levee repair developed by SCS or the Corps were overridden by the democratic political process--Congress fulfilling the wishes its constituents.

<sup>&</sup>lt;sup>307</sup> Many of the Service's efforts to publicize the role of the Small Watershed Program's flood prevention or control effects by the national headquarters and the states must be understood in the context of this threat to long-term funding for the program.

Matching the interests of Washington with local goals proved difficult. The problem boiled down to this: what appeared to be an insignificant change from the national level translated into a major trauma for a single town, watershed, levee district, or individual farmer. A local community would fight hard to protect what it perceived to be in its interests--often by demanding an exception to a national policy, such as those developed for levee repair. Employees of the Service at times shared this disconnect with the national-level policy makers. For example, a district conservationist in a small town had intimate knowledge of the local situation, such as the importance of a small levee or system of drainage ditches, and was also subject to local pressure in order to get something repaired quickly. An area or state conservationist may have received pressure from the state or Congressional representatives intent on solving a specific problem in their district.

To a large extent, the relatively loose organizational structure of the Service functioned well in flood recovery work. SCS was able to attack the greatest problems in each state or region--whether it be levee repair, wetlands, debris removal, streambank stabilization, or channel clear-out. Although from a national level, the approaches and priorities of the nine states to flood recovery efforts may have appeared untidy and at times contradictory, on the ground, communities, conservation districts, and individuals--the taxpayers--got the assistance they needed.

## Appendix A

## **Frequently Used Acronyms**

	1000
Agricultural Stabilization and Conservation Service	ASCS AC
Area Conservationist	
Bureau of Indian Affairs	BIA
Cable News Network	CNN
Computer Aided Design	CAD
Conservation Reserve Program	CRP
Cooperative Extension Service	CES
Damage Survey Report	DSR
Department of Housing and Urban Development	HUD
Disaster Field Office	DFO
District Conservationist	DC
Economic Development Administration	EDA
Economics and Social Sciences Division (SCS)	ECN
Emergency Conservation Program	ECP
Emergency Watershed Protection	EWP
Emergency Wetlands Reserve Program	EWRP
Engineering Division (SCS)	ENG
Environmental Defense Fund	EDF
Environmental Protection Agency	EPA
Extension Service	ES
Farmer's Home Administration	FmHA
Federal Emergency Management Administration	FEMA
Fish and Wildlife Service	FWS
Food Safety and Inspection Service	FSIS
Food Security Act	FSA
Memorandum of Understanding	MOU
Midwest National Technical Center	MNTC
National Agricultural Library	NAL
National Headquarters (SCS)	NHQ
National Oceanic and Atmospheric Administration	NOAA
National Park Service	NPS
National Weather Service	NWS
Office of the Inspector General	OIG
Office of Management and Budget	OMB
Resource Conservation and Development	RC&D

Rural Development Administration	RDA
Resources Inventory and Geographic Information	
System Division	RIGIS
Scientific Assessment and Strategy Team	SAST
Small Business Administration	SBA
Soil Conservation Service	SCS
Tree Assistance Program	TAP
U. S. Army Corps of Engineers	COE
U. S. Department of Agriculture	USDA
U. S. Geological Survey	USGS
U. S. Government Printing Office	GPO
Watershed Projects Division	WPD
Water Science and Technology Board	WSTB
Wetlands Reserve Program	WRP

### Appendix **B**

### **Assistance from SCS Personnel**

The following is a list of SCS personnel who were interviewed or provided other important information to assist in the preparation of this history.

Martin W. Adkins	EWP Coordinator Assistant State Conservationist	Iowa Mississippi
David Anderson	Assistant State Conservationist Assistant State Conservationist	Iowa
Lyle Asell	State Resource Conservationist	Iowa Iowa
James E. Ayen	Liaison for the West and Midwest	WPD
Larry Babich		Missouri
Robert E. Ball	State Resources Information Manager	Illinois
Gene P. Barickman	Biologist	
Terry Barney	Natural Resources Data Base Manager	Missouri
Robert Bartles	Midwest Flood Recovery Coordinator	MTNC
Lynn A. Betts	Information Officer	Iowa
Dennis F. Beyer	Design Engineer	Illinois
George Bluhm	Midwest Flood Coordinator	WPD
Ross B. Braun	Water Resources Planning Specialist	Missouri
Arthur A. Bryant	Supervisory Contract Specialist	Iowa
Don Butz	Program Manager	Land Treat.
Timothy Christian	Public Affairs Specialist	Kansas
Charles E. Cobb	Deputy State Conservationist	Wisconsin
J. Reese Coulter	Area Engineer	Missouri
Earl E. Evans	Civil Engineer	Illinois
James L. Evans	Assistant State Conservation Engineer	Illinois
Paul G. Goldsmith	District Conservationist	Iowa
Pat Graham	Biologist	Missouri
Allen Green	Assistant State Conservationist	Missouri
Laura E. Greiner	Water Quality Information Specialist	Iowa
Douglas Helms	National Historian	ECN
Leroy Holtsclaw	Assistant State Conservationist	South Dakota
George T. Huey	State Administrative Officer	Illinois
Keith Hunt	Contract Specialist	Iowa
Mervin Ice	National Construction Engineer	ENG
Mark J. Jensen	State Conservation Engineer	Iowa
Kay Kitchen-Maran	Public Affairs Specialist	Illinois
Norm A. Klopfenstein	State Information Officer	Missouri
Jack D. Langford	Civil Engineer	Iowa
Glenn Lawson	GIS Specialist	RIGIS

Brian Lehman William Lewis, Jr. Ione Lyne Richard P. Macho Pat McGrane Mary Ann McQuinn Harry N. Means Paige E. Mitchell Thomas J. O'Conner Karl Otte Gary N. Parker John Peterson Cordes L. Potter Lane Price Charles E. Rahm James Reel Edward G. Riekert Richard A. Rogers David F. Rohlf Roger G. Schnoor Harry S. Slawter Lanica A. Stanton	Civil Engineering Technician Agricultural Economist Secretary Area Conservationist Public Affairs Specialist Public Affairs Specialist Public Affairs Specialist State Conservation Engineer Public Affairs Specialist Rural Development Forester Assistant Director Assistant State Conservationist Assistant Chief for the Midwest Civil Engineer National GIS Applications Leader Public Affairs Specialist WRPS Leader Director Archaeologist Assistant State Con. Engineer Civil Engineer Assistant State Conservationist Assistant State Conservationist	Iowa Illinois WPD Illinois Nebraska Pub. Aff. Illinois Illinois Iowa WPD Illinois NHQ Missouri RIGIS Missouri Iowa WPD Iowa Iowa Iowa Iowa Iowa Iowa
David F. Rohlf	Assistant State Con. Engineer	Iowa
Harry S. Slawter Janice A. Stanton Linda Stoltz	Assistant State Conservationist Administrative Services Officer Contract Specialist	Illinois Illinois Ohio
Bruce Thompson Marge Theurer Kenneth D. Vogt James Wallace Thomas Wehri Michael D. Wells Wes Wiedenmeyer	State Soil Scientist Program Manager Assistant State Soil Scientist State Conservation Engineer Assistant Director Assistant State Conservationist State Conservation Engineer	Missouri WPD Missouri Kansas WPD Missouri North Dakota
Stacey Wood	GIS Specialist	RIGIS

.

.

# Appendix C

## **Photography Credits**

page	
cover	Scouring in Missouri. Photo by Norm Klopfenstein, SCS-Missouri.
2	Flooding in Iowa. Photo by Ken Hammond, USDA, 93 CS 358.
14	Center-pivot irrigation system in Iowa. Photo by Ken Hammond, USDA, 93 BW 1669-33.
29	Secretary Espy tours flood area. Photo by Meg Evans, USDA, 93 CN 0474-17.
35	Terraces in Iowa. Photo by Tim McCabe, SCS, IA-2856.
38	Debris near bridge in Missouri. Photo by Steven Phillips, SCS.
61	Farm near Hartsburg, Missouri. Photo by Charles Rahm, SCS-Missouri.
66	Levee break along the Missouri. Photo by Charles Rahm, SCS-Missouri.
72	Levee repairs in Missouri. Photo by Charles Rahm, SCS-Missouri.
80	Levee break in Illinois. Photo from Public Affairs Staff, SCS-Illinois.
84	Wetlands in Minnesota. SCS MIN-1808.
89	Scouring in Missouri. Photo by Norm Klopfenstein, SCS-Missouri.
113	Damage inspection in Illinois. Photo from Public Affairs Staff, SCS-Illinois.
147	Sand in Missouri. Photo by Charles Rahm, SCS-Missouri.
152	Conservation tillage in Minnesota. Photo by Gene Alexander, SCS, MN-1896.

.

.

#### Appendix D

#### List of Charts and Maps

#### **Charts/Diagrams**

Damage Survey Reports Received (by type and state)	page 52
Projects Eligible for EWP Assistance (by type)	53
Projects Eligible for EWP Assistance (by state)	54
Versacad Designs of EWP Projects	125-127

Maps

Nine Flood States	page	4
Area Inundated		15
North Dakota		105
South Dakota		106
Illinois		112
Iowa		123
Kansas		136
Minnesota		154
Missouri		142
Nebraska		137
Wisconsin		153

The charts and graphs were prepared by J. D. Ross of SCS's Economics and Social Sciences Division.

Versacad diagrams were prepared by Brian Lehman, Civil Engineering Technician in Iowa.

Maps used in the volume were prepared by the Soil Conservation Service's Resources Inventory and Geographic Information System Division. The author gratefully acknowledges the assistance of Lane Price and Stacey Wood.