STATEMENT OF

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BEFORE THE

SUBCOMMITTEE ON OVERSIGHT AND REVIEW

COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION

U.S. HOUSE OF REPRESENTATIVES

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TESTIMONY FOR THE RECORD

HEARINGS BEFORE THE SUBCOMMITTEE ON OVERSIGHT AND REVIEW, HOUSE COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION, JULY 18, 1979

This written testimony supplements the oral statement of Douglas Costle, Administrator of the U.S. Environmental Protection Agency, presented at the hearings on Section 208 and the Water Quality Management Program. The hearings focus on the significance of nonpoint sources in water pollution and the role of the Water Quality Management program in controlling them.

This written statement contains a brief overview and background; a detailed discussion of the nonpoint source problem; a discussion of nonpoint source data deficiencies and needs; descriptions of practices used to control nonpoint sources; progress of the 208 program and a description of the WQM strategy for controlling nonpoint sources.

I. OVERVIEW AND BACKGROUND

The Section 208 effort under the Water Quality Management program is essential to the quality of our Nation's waters. It is the only EPA program aimed directly at nonpoint source water pollution problems.

A large body of research during the last decade has produced evidence that nonpoint sources contribute a major share of many serious pollutants to our lakes and streams. Without controls, nonpoint source pollution will prevent achievement in a portion of water in at least 37 States of our 1983 goal of fishable and swimmable waters.

There is little doubt that nonpoint sources have a direct, serious impact on the uses Americans make of water. Nonpoint source pollution has appeared in community after community as a pathway for toxic and hazardous pollutants with direct effects on human health. We view with increasing concern the frequent findings of heavy metals in urban and mining runoff, and pesticides and herbicides in agricultural runoff. In many urban areas, nonpoint pollution has significantly raised the cost of providing safe domestic drinking supplies.

In many rural areas, nonpoint sources have contaminated family wells and livestock water supplies. Saline pollution, which is also nonpoint in nature, significantly impairs yields of many irrigated crops in western States.

There are many pollutants involved in nonpoint sources which can degrade both surface and ground water quality. Some of the major ones are large amounts of silt; organic debris; heavy metals such as lead; grease and oil; nutrients such as nitrogen and phosphorus; pesticides such as Toxaphene and Sevin; toxic organic chemicals, nitrates; and dissolved solids.

The country stands today at a crossroad in its progress toward the 1983 goals--while we have taken giant steps to clean up point source pollution, similar progress on nonpoint source control is lacking. The job of controlling nonpoint sources will not be easy. The political and economic problems to be solved in applying nonpoint controls ("best management practices" or "BMP's") are substantial. Although many State and local governments have already led the way by enacting sediment control, cost-sharing, forest practices, or mine-drainage laws on their own initiative, many areas are not controlling the nonpoint problems. In several of our nonpoint categories a better technical base on problem and solutions is essential if we are to make an effective case for control. In the past eight years, we have just begun to fathom the true depths of our water problems.

The Water Quality Management Program has completed the initial planning phase, and has begun the job of carrying out the plans that the 225 agencies completed. As of July 2, 1979, 107 of the 176 areawide plans started in FY 74-76 have been certified by the States, and 68 have received EPA approval. Of the Statewide plans, which were started in FY 76, 22 have been certified, and 7 have been approved. We expect all the remaining certifications and approvals by December, 1979. Table I, below, gives grant-by-grant information on the status of certifications and approvals.

It is clear that Congress gave the 208 program a very broad charge in the 1972 Clean Water Act Amendments. A complete list of the requirements appears in section 208(b)(2). It says that 208 plans will address both point and nonpoint source controls--not only sewage collection and treatment needs, plant siting, and construction priorities, but also the control of runoff from urban areas, agriculture, silviculture, mining, and construction, the prevention of saline intrusion, and the protection of ground water in the disposal of wastes.

Considering the breadth of problems the program addresses, and the large number of local, State and Federal agencies who must cooperate to solve them, it is not surprising that the program has not accomplished all the Congress expected of it. Most of the initial focus was on point sources, which is understandable as the primary emphasis of the Act was point sources. The first 208 agencies designated were those in metropolitan areas where point source problems predominated. Later, when States began 208 planning, nonpoint source problems received more attention.

TABLE I

STATUS OF 208 PLANS -7/2/79

TOTAL CERTIFIED: 129
TOTAL APPROVED: 75

Region/State/Areawide		Certified	Approved
I	Greater Portland	X	X
	Southern Maine	X	X
	Northern Maine	X	X
	Androscoggin	X	X
	Southern Kennebec	X	X
	Rhode Island	X Partial	X
	Vermont	X Partial	
	Southeastern MA	X	
	Old Colony	X	
	Martha's Vineyard	X	
II	Tri County NJ	X	X
	Middlesex County	X	
	Nassau-Suffolk	X	
	Mercer County	X	
III	New Castle County	X	X
	Baltimore	X	X
	Roanoke	X	X
	Rappahannock	X	X
	Wash COG	X Partial	
IV	Central Midlands	X	
	Alabama	X Partial	
	First TN-VA	X	
	Charleston	X	
	Tennessee	X	
	Waccamaw SC	X	
	West Alabama	X	X
	Orlando FL	X	X
	Volusia County	X	X
	Tampa Bay	X	X
	Tallahassee	X	X
	Central Florida	X	X
	Georgia	X	
	Southwest Florida	X	
	Macon-Bibb County	X	X
	Chatham County	X	X
	Atlanta	X	X
	Kentuckiana	X	X
	Raleigh NC	X	X
	Memphis	X	X
	Knoxville	X	X
	South Carolina	X Partial	X Partial
	Mississippi	X Partial	
	Mid Cumberland	X	
	Chattanooga	X	
	Appalachian	X	
	Low Country	X	
	Florida	X	
	Brevard	X	
	Palm Beach	X	
	Pensacola	X	
	Broward	X	
	Dade County	X	
V	Detroit	X	X
	So Cen Michigan	X	X
	Flint Michigan	X	X
	Jackson Michigan	X	X
	East Cen Michigan	X	X
	West MI Shoreline	X	X
	Grand Rapids	X	X
	Lansing	X	X
	Eastern Upp Penin	X	X
	Northwest MI	X	X
	Northeast	X	X
	West Upp Penin	X	X
	Southwestern MI	X	X
	Central Upp Penin	X	X
	Cincinnati	X	X
	Toledo	X	X
	Eastgate	X	X
	Miami Valley	X	
VI	Oklahoma	X	
	Central Texas	X	
	New Mexico	X	X
	Indian Nations	X	X
	North Central TX	X	
	Southeast Texas	X	
	Houston	X	
	Alamo Area	X	
	Coastal Bend	X	
	Lower Rio Grande	X	
	Texas	X	X
	Arkansas	X	
	Arkhoma	X	
VII	Des Moines	X	X
	Iowa	X partial	X
	Kansas	X	
	Mid-America	X	
	East-West Gateway	X	
VIII	Pikes Peak	X	X
	Pueblo CO	X	X
	Denver	X	X
	Larimer-Weld	X	X
	South Dakota	X	
	Sixth Dist SD	X	
	Southeastern SD	X	
	Provo UT	X	X
	Salt Lake County	X	X
	Weber River	X	X
	Uintah Basin	X	
IX	Pima AZ	X	X
	Central Arizona	X	X
	Dist 4, Yuma AZ	X	X
	Southeastern AZ	X	X
	*Ventura County	X	X
	*Monterey Bay	X	X
	*San Diego	X	X
	*San Fran Bay	X	X
	*Washoe NV	X	X
	*Clark County NV	X	X
	*Northern Arizona	X	X
	*Nevada	X	X
	*Hawaii	X	X
	*Sacramento	X	
	*California	X	
	*Phoenix	X	
	*Los Angeles	X	X
	*Tahoe	X	X
	*Carson River	X	
	*Trust Terr	X	
	*Guam	X	
X	Oregon	X	
	Portland	X	X
	Mid-Willamette	X	X
	Lane COG	X	X
	Rogue Valley	X	X
	Washington	X Partial	
	Clark County	X	X
	Metro Seattle	X	X
	Snohomish	X	X

*Additions this reporting period
States

Given two to three years to complete a plan requiring not only technical, but political, institutional, and budget decisions, it soon became evident that only a few of the major problems could be addressed. In many instances, sufficient cause and effect water quality data has been lacking. Efforts in the 208 program were originally directed toward solving the obvious problems.

There have also been other problems which have reduced the program effectiveness. One problem was the large number of problem areas to be covered in such a short time frame. Another was the large number of Federal, State, areawide, and local agencies involved in the program and the coordination and conflict resolution required. Funding levels fluctuated from year to year, disrupting the program's continuity and causing high staff turnover in the field. The previous Administration attached a low priority to section 208 in relation to the permit and construction grants programs, and EPA was late to issue necessary WQM regulations and guidance, which contributed to the loss (to the program) of $137 million in appropriated funds.

However, given the broad charge of section 208(b)(2) and the many constraints placed on the program, the State and areawide agencies accomplished a great deal in FY 73-77. The list of WQM program successes and implementation projects spinning off of WQM plans grows every day as more of the WQM plans receive certification and approval and enter the implementation phase. Many examples of implementation projects for the nonpoint source problem areas--agriculture, silviculture, urban runoff, construction, mining, and ground water contamination--are described within the testimony.

Since 1973, Congress has authorized 750 million dollars for the 208 grant program. A total of 469 million dollars has been appropriated since FY 73, and less than half of that amount has been expended--$220 million. Current obligations of 85 million dollars with an additional obligation of 14 million dollars by August are funding the continuing program. Table II presents a funding summary for the 208 grant program to date.

In fact, as the figures in Table III illustrate, the program has actually saved the taxpayers over twice what they have invested in the program, just by finding more cost-effective treatment processes for municipal point sources. Table III cites 23 examples with a total capital cost-savings of approximately $500 million which are more specifically described later in the testimony.

TABLE II

208 FUNDING SUMMARY

($-millions)

	73	74	75	76	77	78	79	TOTAL
AUTHORIZED	50	100	150	--	150	150	150	750
APPROPRIATED	50	100	150	53	15	69	32*	469
OBLIGATED	--	13.2	149.9	53.0	14.4	69.0	16.0	315.5**

* 2 million taken for Agency pay raise; not available for obligation

** Obligation as of July 9, 1979

NOTE 1: Total expenditures to date are $220 million

NOTE 2: $137 million in FY 73 and 74 obligation authority lapsed, unspent

TABLE III

--SUMMARY--

COST SAVINGS IN MUNICIPAL TREATMENT SYSTEMS RESULTING FROM 208 PLANNING

Region	Location	Description of Action	SAVINGS ($-millions) Capital	 O&M (annual)
II	Erie-Niagara, NY	cost-effectiveness studies	35	5.9
	Central New York area	stream reclassification		.027
	New York City	population projection work	130	
III	New Castle Co., Del.	sewer extension plan revision	2	
	Virginia--Potomac River	embayment standards evaluation	11.8	
	North Beckley, W.Va	refined waste load allocation	1.93	
IV	Mississippi--State	hydrologic controlled release oxidation pond systems	25-100	
	Mississippi--State	Gulf Coast regional treatment plan	7.5	3.7
	North Carolina--State	seasonal effluent limits		8-13
	Nashville, Tenn.	modification to effluent limits	3	
	Knoxville, Tenn.	modification to effluent limits	2-3	
	First Tenn-Va Dev't District	regional sewage treatment plant	42	
	Chattanooga, Tenn.	modification to effluent limits	20	

TABLE III, cont.

Region	Location	Description of Action	SAVINGS ($-millions) Capital	O&M (annual)
VI	Tulsa, Ok.	decision not to chlorinate	.063	
	Arlington, Tex.	inclusion of NPS loads in WQ model; decision to use AST instead of AWT at trtmt plants	100	
VIII	Mountainland area, Utah	modification to effluent limits, regionalization	3.5	.112
	Salt Lake County, Utah	modification to effluent limits, regionalization	18	.90
	Pikes Peak, Col.	septic tank study	3	
	Denver, Col.	revised population projections	100-200	
	Southwest Wyoming area	local initiatives following 208 planning	.40	
X	Pocatello, Id.	land application of phosphorus-rich industrial effluent	3	1
	Salem, Or.	revised population, wasteload projections	1.5	
	Eugene/Springfield, Or.	regionalization	3	
TOTAL				

Note: This is just a partial listing of cost-savings resulting from 208 plans. The figures are approximate. However, sticking to the lower end of the range when ranges are given, the total cost savings to the Nation from this sample of actions are approximately $500 million (capital costs) and approximately $16 million/yr. (operations and maintenance)

II. THE NONPOINT SOURCE PROBLEM

Nonpoint source loadings are causing significant problems which afect every region of our nation. There is a substantial array of evidence, much of it provided by 208 State and areawide agencies, which indicates water quality standards in many streams and lakes will not be reached even though treatment will be provided to municipal and industrial point sources. The majority of States have indicated at least some of the river basins within their borders will not attain the Clean Water Act's 1983 goal of "fishable/swimmable" waters because nonpoint pollution sources will not be treated at that time. We will provide later in this testimony a number of case studies taken from 208 plans which show that water uses are presently impaired for domestic, industrial, and agricultural water supply; for recreation; and for fish and wildlife use.

The following two tables (Tables IV and V) indicate the extent and effect of nonpoint source problems. While these figures suggest that the magnitude of nonpoint loadings is significant on a national scale, we also have evidence that they are causing real problems in a high proportion of States and watersheds. Consider the following:

- 109 of the first 149 areawide agencies designated under section 208 identified agricultural, construction and urban stormwater runoff (which does not include combined sewer overflows) as principal contributors to their water quality problems.
- At least 37 States have reported that they will be unable to meet 1983 goals in at least part of their waters because of nonpoint pollution.
- Although toxic metal loadings are difficult to estimate on a national scale, studies of individual cities have shown concentrations of certain toxic metals in urban stormwater runoff to be many times greater than concentrations in municipal sewage.
- By 1981, BOD loadings from untreated urban runoff will equal those from treated municipal effluent and combined sewer overflows.

The following information shows the magnitude of nonpoint source loadings. It indicates that when point source treatment goals are reached, significant nonpoint source problems will still exist.

- Sediment loads from man-made nonpoint sources are estimated to be 360 times higher than those from municipal and industrial point sources after treatment, and three times higher than those from natural background.
- Biochemical oxygen demand from nonpoint sources is estimated to be five times higher than either treated point sources or natural background.
- Total nitrogen from nonpoint sources is estimated to be four times higher than that from treated point sources and three times higher than natural background. Total phosphorus from nonpoint sources is

TABLE IV

NONPOINT SOURCES OF POLLUTION[1]

	Percentage of Basins Affected* by Type of Nonpoint Source							
Region (Number of Basins)	Urban Runoff	Construction	Hydrologic Modification	Silviculture	Mining	Agriculture	Solid Waste disposal	Individual disposal
Northeast (40)	70	15	20	10	20	55	35	63
Southeast (47)	57	2	21	30	15	62	9	40
Great Lakes (41)	54	7	2	15	41	59	15	39
North Central (35)	54	6	3	6	40	89	9	29
South Central (30)	50	0	23	13	53	87	13	40
Southwest (22)	23	0	18	5	36	73	0	35
Northwest (22)	23	23	23	27	23	55	9	32
Islands (9)	67	67	22	0	0	78	22	89
Total (246)	52	9	15	15	30	68	14	43

*In whole or part.

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[1] EPA's "National Water Quality Inventory -- 1977 Report to Congress" (October 1978)

TABLE V

EFFECTS OF NONPOINT SOURCES OF POLLUTION[1]

	Percentage of Basins Affected* by Type of Pollution Problem from Nonpoint Sources								
Region (Number of basins)	Bacteria	Oxygen depletion	Nutrients	Suspended solids	Dissolved solids	pH	Oil and grease	Toxics	Pesticides
Northeast (40)	70	53	63	65	10	18	15	33	18
Southeast (47)	66	74	57	34	4	9	4	11	23
Great Lakes (41)	51	54	44	56	27	37	20	34	15
North Central (35)	69	66	63	80	51	20	0	51	37
South Central (30)	53	43	63	37	70	23	3	47	40
Southwest (22)	36	14	45	32	68	14	14	27	0
Northwest (22)	64	18	55	64	14	9	5	32	0
Islands (9)	89	44	44	100	0	0	0	22	44
Total (246)	61	51	56	54	30	18	9	32	22

*In whole or part.

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[1] EPA's "National Water Quality Inventory - 1977 Report to Congress" (October 1978)

slightly higher than from point sources and twice as high as natural background.

- Loadings of fecal coliform bacteria from nonpoint sources will be at least 50 times higher than from point sources, once secondary treatment with disinfection is achieved for all municipal sources.

While every region of the country is impacted significantly by some type of nonpoint pollution, the types of problems vary dramatically from region to region, according to the topography, climate and types of land use which prevail. One implication of this is that the solution of nonpoint source problems will require a flexible approach which takes these variations into account.

State and areawide plans completed during the past six months are providing much more specific information on nonpoint source problems than we have had previously. Since agriculture and urban runoff have been identified as the major nonpoint sources, it is not surprising that we have more data on these problems than on others.

A. Agricultural Nonpoint Source Problems

Agricultural activities are the most widespread cause of nonpoint source problems, affecting over two-thirds of the river basins in the Nation. The regions most affected by agricultural nonpoint source pollution are the North Central, South Central, Southwest, and Island regions. Agricultural pollution can come either from runoff or irrigation return flows. Runoff is the major problem in the North Central region, primarily from spring snow melt, and in the Islands, from heavy rains. Irrigation return flows are the major problems in the Southwest, South Central, and North Central regions. These regions report many more problems with dissolved solids (salinity) than the rest of the country.

In the area of non-irrigated agriculture:

- Over 50 percent of the total man-made sediment load of the Nation is from agriculture.

- Only 31 States have average annual erosion rates that meet the generally-accepted standard of five tons or less per acre.

- Since 1935, 100 million acres have been damaged so badly they cannot be cultivated; on another 100 million acres, more than half the topsoil has been lost to erosion. It has been estimated that the U.S. loses one billion dollars worth of topsoil annually.

With respect to irrigated agriculture:

- Of the 195 million acre-feet of irrigation water Federal projects supply to the western States, about 42 million acre-feet are lost through seepage in the canals, and 24 million acre-feet are lost to non-agricultural weeds. Each acre-foot of water lost results in less water available in the stream to maintain flow with a resultant decrease in water quality.

- Saline soils reduce crop production 25 percent on the irrigated lands in the West; 50 percent of irrigated acreage is threatened by increased salinity; and over a third of the soils in the five Western States are highly saline.

Another aspect of the agricultural nonpoint source problem is animal feedlots:

- In a USDA survey convering 90 percent of the Nation's feedlots for beef, dairy, and swine, 29 percent had water quality problems.
- 50 percent of the smaller feedlots (under 1000 animals) contribute high nutrient loads to water bodies.
- 20 States have 98 percent of the feedlots and 95 percent of the feedlots associated with water quality problems.

Following are specific examples of agricultural nonpoint source problems identified in 208 plans. These examples show how various aspects of agricultural pollution disrupt recreation, water supplies, and fisheries with a variety of pollutants ranging from sediment to synthetic organic chemicals:

Maine: Has identified 9 lakes and portions of 3 rivers (Aroostook, St. Johns, Prestile) as having significant water quality problems (coliform, DO, nutrients, sediment) attributable to agricultural nonpoint sources. Specific water quality standards violations have been documented on some lakes for coliform and DO.

Connecticut: Agricultural erosion statewide was determined to be over 12 tons/acre/year (acceptable value generally 3-5 tons/acre/year). Problems are especially noticeable in Lake Waramug and the Housatonic River. Recreation and water supply uses are being impaired.

Massachusetts: Rural nonpoint source problems (agricultural runoff and erosion, livestock, and rural septic systems) are causing eutrophication problems in several lakes and reservoirs in Berkshire County, which are critical because of water supply and recreation demands of tourist industry. Some 60-90 percent of nutrient loadings to these lakes are from nonpoint sources. Water quality standards violations have been documented for nutrients, coliform, and dissolved oxygen.

Delaware: Rural nonpoint source (agriculture, animal wastes, and rural septic systems) are causing coliform and nitrate problems in ground water drinking supplies in Sussex County. Water quality standards violations have been documented (60-100 mg/l nitrates; standard is 10 mg/l).

Virginia: Agricultural and urban runoff are contributing to eutrophication threatening Occoquan Reservoir (drinking supply for 700,000) and may negate benefits of a very expensive AWT plant.

Maryland: Animal wastes and other agricultural runoff are resulting in coliform water quality standards violations in several rivers (Northeast Maryland, Carrol County, Frederick County, and Howard County) and two reservoirs (Lock Raven and Liberty) which supply drinking water to Baltimore.

North Carolina: Average total nitrogen levels of 7 mg/l were found in Union County on a creek tributary to Lane Creek where fish kills and 0 mg/l DO were observed. Animal operations are believed the cause. Herbicide related fish kills are found in Richardson Creek and Twelve Mile Creek. Erosion rates of 20-60 tons/acre/year have been observed in areas of the State. On the upper Neuse River, DO concentrations fell to about 1 mg/l during certain storm conditions. During all storm events measured, high concentrations for suspended solids were observed in both the small streams and larger rivers. The Chowan River has experienced severe algal blooms which have affected the fishery resources in the estuary, ruined recreation beaches, and resulted in objectionable odors and deposits of decaying algae. About 85 percent of the nitrogen input is from nonpoint sources, with agricultural areas accounting for 50 percent of the total.

Tennessee: High total phosphorus and total nitrogen loadings from agricultural land use have resulted in the Chickamauga and Nicajack Reservoir being classified eutrophic. Algal bloom preclude recreation in certain areas.

Illinois: Eighteen public water supplies in Illinois periodically exceed the nitrate level recommended to prevent methemoglobinemia in infants (similar in effect to the "blue baby" syndrome). A majority of Illinois surface waters violate phosphorous and heavy metal standards at intervals throughout the year.

Arkansas: In one basin intensively studied: 2 million tons of sediment are delivered each year; out of 60 streams in this basin, 47 are not suitable for swimming and 37 not suitable for fishing because of agricultural nonpoint sources; streams in eastern Arkansas violate criteria for pesticide Toxaphene.

Louisiana: Lake Providence (Quanchita Basin) and Round Lake have deteriorated due to high sediment and pesticide residues from agricultural nonpoint sources; private and commercial fishing has been banned by the State in Lake Providence because Toxaphene levels in fish violate standards.

New Mexico: The State projects problems for present and future use of San Juan and Rio Grande Rivers for irrigation due to sediment and salinity.

Oklahoma: Little Washita watershed has a major water quality problem resulting from sediment; 12 other segments (out of 59) have been identified as having major nonpoint source problems.

Texas: 33 out of 297 segments have existing or potential water quality problems related to nonpoint sources.

Missouri: Sediment and agricultural chemicals cause turbidity and pesticide parameters to be violated in the northern 38 percent of the State, in the Salt, Fox, Wyaconda and Upper Middle Fabius River. In the Salt River, 21 percent of basin (363,000 acreas) has erosion of over 30 tons/acre/year.

Nebraska: Eastern and central parts of the state are impacted by sediment, animal wastes, and agricultural chemicals, causing violation of standards for nitrates, turbidity, fecal coliform and TDS. Over 1.5 million acres have been identified as sources.

Kansas: Six areas have nutrient and salt problems from agricultural chemicals and irrigation return flows (Stranger Creek, Upper Nemaba, Upper Wakarusa, Wolf River, Washington State Lake, and Soldier Creek). These cover a total of 627,000 acres.

North Dakota: In the Souris River agricultural activities have resulted in nutrient, TDS and suspended solids violations. These parameters are violated 80 percent of the time and nonpoint sources account for 90 percent of the load. The area recently experienced a major duck kill. The State has identified 10,000 acres as a high priority for treatment.

South Dakota: The James River is impacted by agriculture activities that affect fishery and drinking waters. Parameters violated are suspended solids, TDS and nutrients. The State has identified 17,000 acres needing treatment. Lake Herman suffers from sedimentation and nutrients. Parameters are violated 100 percent of the time with 90 percent of load coming from nonpoint sources.

Wyoming: The Green River is impacted by irrigation returns, overgrazing and septic tanks, which threaten agriculture, recreation and drinking water uses. Public lands contribute 8.9 million tons/year of sediment and 145,000 tons/year of salt. About 78 percent of the phosphorus loadings are contributed from nonpoint sources and they are causing eutrophication in the Flaming Gorge Reservoir. The Wind/Big Horn River is similarly impacted. Nonpoint sources contribute 99 percent of the total phosphorus load to Yellowtail Reservoir. Sources of phosphorus are agricultural fertilizer, septic tanks, feedlots and erosion. Eleven of the 20 problem stream segments will fail to meet water quality standards in 1983 due to nonpoint sources.

Colorado and Utah: The Colorado River is impacted by agriculture and hydrologic modification, causing salinity parameters to be violated. About 42 percent of the salinity in the upper basin is caused by irrigation.

Montana: The Missouri, Yellowstone and the Big Horn Rivers have approximately 4000 stream miles degraded by nonpoint source pollution (13 percent of State's streams). Sediment causes 2500 miles to be degraded and salinity affects 1400 miles. Parameters violated are salinity, bacteria, nutrients and suspended solids.

Idaho: Severe water quality problems have been identified in 5 stream reaches in irrigated areas involving 350,000 acres, and 18 reaches in nonirrigated areas involving 1,300,000 acres. In these cases, fisheries and recreation uses are impacted because of turbidity, sediment, algae, reduced oxygen, bacteria, salinity, temperature, and reduced flows.

Washington: Priority water quality problems have been identified in 27 stream segments involving 1700 dairies, 1,000,000 irrigated acres, and 5,200,000 nonirrigated acres. Fisheries and recreation uses are impacted because of turbidity, sediment, algae, reduced oxygen, temperature, bacteria, salinity, and reduced flows.

B. Urban Runoff Problems

Urban runoff is a problem of increasing severity. Urbanization changes hydrologic cycles and expands impervious areas. Runoff flowing through the urban environment flushes atmospheric fallout, traffic-related deposits, litter, and construction debris into receiving waters.

Urban runoff is a primary cause of water quality degradation in populated areas. Many pollutants are found in urban runoff, with severe effects generally coming from suspended solids and toxics, particularly heavy metals. Urban runoff also frequently includes bacteria, oxygen-demanding material, nutrients, oil, and grease.

Nationwide, over 50 percent of the river basins are affected by urban runoff. The percentage is highest (70 percent) in the Northeast and lowest (23 percent) in the Southwest and Northwest.

The two figures which follow illustrate the magnitude of pollution from urban runoff. This information was prepared as part of the Agency's 1978 Needs Survey. Stormwater discharge data was analyzed for 15 cities across the nation. Figures I and II provide data at four of those locations.

As point source controls on industrial and municipal dischargers take effect, urban runoff, if uncontrolled, increases because of the growth of urban areas. The 1978 Needs Survey estimates that in the year 2000, more than 130 million persons will occupy 32,244,000 acres in urbanized areas served by separate storm sewers.

To further support this data, we have provided 23 examples from completed 208 plans which underline the extent of pollution from urban runoff and its effect on urban water quality. All the evidence, taken together, suggests that point source controls alone will not achieve the goals of the Act in many populated areas because of urban runoff.

Figure 1
Pollutant Loading Summary*
Durham Site Study (Third Fork Creek Basin)

Source	Average Pollutant Loads (lb/yr)			
	BOD	TKN	SS	Pb
Upstream flow	0	0	0	0
WWTP effluent	165,245	82,623	462,687	165
Combined sewer overflow	NA	NA	NA	NA
Urban stormwater runoff	328,769	17,159	32,251,331	12,119
Total	494,014	99,782	32,414,018	12,284

*EPA 1978 Needs Survey.

Figure 1
Pollutant Loading Summary
Ann Arbor Site Study (Huron River Basin)

Source	Average Pollutant Loads (10^6 lb/yr)			
	BOD	TKN	SS	Pb
Upstream flow	2.57	0.71	5.46	0.003
WWTP effluent	1.20	1.11	1.20	0.000006
Combined sewer overflow	NA	NA	NA	NA
Urban stormwater runoff	0.82	0.10	13.51	0.017
Total	4.59	1.92	20.17	0.200

Figure 2*
Pollutant Loading Summary
Tulsa Site Study (Bird Creek Basin)

Source	Average Pollutant Loads (lb/yr)			
	BOD	TKN	SS	Pb
Upstream flow	6,387,391	1,424,783	115,886,398	82,117
WWTP effluent	1,382,722	306,845	1,620,527	3,196
Combined sewer overflow	0	0	0	0
Urban stormwater runoff	2,572,809	183,072	155,884,748	387,949
Total	10,342,922	1,914,700	273,391,623	473,262

*EPA Needs Survey.

Fiqure 2
Pollutant Loading Summary
Des Moines Site Study (Des Moines River Basin)

Source	Average Pollutant Loads (10^6 lb/yr)			
	BOD	TKN	SS	Pb
Upstream flow	38.99	11.99	3,504.24	0.03
WWTP effluent	3.71	1.35	3.71	0.005
Combined sewer overflow*	0.70	0.09	3.03	0.02
Urban stormwater runoff*	4.72	0.32	39.65	0.12
Total	48.12	13.75	3,550.63	0.175

*Watershed area: combined sewer - 4,018 acres and stormwater runof - 45,000 acres.

Assessment of Urban Runoff and Its Effects on Beneficial Uses

Roanoke, Virginia: Wet weather flows cause considerable degradation in water quality as measured on three streams leading to the Roanoke River. Total solids and BOD concentrations increased two and one-half times. Wastewater treatment was upgraded from 86 percent to 93 percent BOD removal, yet there was no dramatic reduction in BOD load (3.3 million pounds before upgrading; 3.1 million pounds after).

Durham, North Carolina: If Durham provided 100 percent removal of organics and suspended solids from the raw municipal waste on an annual basis, the total reduction of pollutants discharged to the receiving water would only be 59 percent of the ultimate BOD, and 5 percent of the suspended solids.

Long Island, New York: Stormwater runoff, the predominant source of coliform bacteria, is responsible for many of the shellfish area closures on Long Island and also threatens many bathing beaches. The area is also concerned over the suspected organic contamination of drinking water supplies from runoff.

Denver, Colorado: The Colorado Department of Health concluded that the major receiving waters in the Denver region are heavily impacted by nonpoint sources of pollution. Bacterial, nutrients and heavy metal pollution problems have all been attributed in part to nonpoint sources. These receiving waters have been described by the Health Department as being unsuitable for beneficial uses such as recreation, agriculture and water supply.

Southern California: Shellfishing and contact recreation are prohibited in Upper Newport Bay because of bacterial pollution. At the mouth of the Los Angeles River, biological conditions are poorer than anywere else in the Los Angeles-Long Beach Harbor complex. The Colorado Lagoon in Long Beach has been closed to shellfishing due to excessive lead concentrations, the result of urban runoff and weak flushing patterns. Studies of Outer Bolsa Bay show a decrease in primary production of epidiatoms primarily due to lead build-up from urban runoff. Bacteria densities in the surf zone, which persist for several days, greatly exceed shellfish and contact recreation standards, are the result of surface-runoff discharges.

Mystic River Basin, Massachusetts: Urban stormwater runoff is a substantial part of the water quality problems. Coliforms and nutrients are commonly the cause of water quality standards violations. The recreational use of the Upper and Lower Mystic Lakes is precluded because of stormwater pollution.

Lake Quinsigamond, Massachusetts: Deteriorating water quality threatens the major recreational lake serving the Worcester metropolitan area in central Massachusetts. Water quality studies show that urban runoff is the major contributor to the lake's accelerated rate of eutrophication. Urban stormwater contributes half the phosphorus and one-sixth of the inorganic nitrogen to the lake. Sediments carried by urban runoff cause turbidity and create sandbars. Bacteria in urban runoff degrade the quality of the lake.

Brockton, Massachusetts: Ellis Brett Pond has been closed to swimming since the mid-1960's because of high coliform bacteria counts and heavy sediment loads from urban runoff. Nitrate, phosphorus, and chloride levels exceed standards because of urban runoff.

Durham, New Hampshire: Stormwater runoff from urbanizing coastal areas produces high levels of coliform bacteria, biochemical oxygen demand, nutrients, and possibly toxicants which degrade water supplies, estuarine shellfish, and recreational opportunities.

Myrtle Beach, South Carolina: Serious problems with fecal coliform and pathogen contamination from urban runoff exist in the beach and surf zone. Forty-two percent of the dry weather discharge samples had fecal coliform counts greater than swimming standard of 200 colonies/100 milliliters. Wet weather samples had counts ranging up to 240,000 colonies/100 milliliters. Storm runoff discharges to the beach through 289 separate pipes ranging from 2 to 48 inches diameter. Because the population grows from 20,000 in winter to 200,000 during the beach season, closing the beach has an extremely heavy impact on the local economy.

Northeastern Illinois (Chicago Metro Area): Urban stormwater runoff causes violation of standards for dissolved oxygen, ammonia, fecal coliform, copper, total iron, lead, manganese, zinc, cyanide, and boron. Pesticides and polychlorinated biphenyls (PCB) have been linked to urban storm drainage. The biological quality of most urbanized streams is poor, with low fish diversity and widespread bluegreen algae. In some streams not even algae can survive because of high turbidity. Sediment washed into urban streams is a major factor limiting fishability. Sediments form bottom deposits like sewage sludge, which contain pesticides and PCB's and release oxygen demanding material to the overlying water.

Washington, D.C. Metropolitan Area: Few streams in the more urbanized portions of the area consistently meet bacterial standards for safe water contact recreation. Sedimentation from excessive upstream erosion is reducing the storage capacity of the Occoquan reservoir. Periodically high suspended solids loads result in higher water treatment costs.

Baltimore, Maryland: As a result of urbanization, streams below Lake Roland are devoid of life forms indicative of clean water and are not suitable for human or animal contact and recreation purposes. One of the most severely degraded streams in the Baltimore region is the Jones Falls watershed.

Georgia: Urban runoff and erosion of denuded areas in Macon and Bibb Counties contribute to violations of water quality standards or criteria for human health, fish and wildlife (DO, mercury, fecal coliform, fecal streptococcus, Lindane, suspended solids and lead). Concentrations of lead exceeded 0.06 mg/l level which is toxic to fresh water fish. In Savannah, urban runoff contributes to suppression of DO levels and elevation of fecal coliform counts, lead, zinc and copper. The presence of toxic pollutants and pathogenic bacteria cause concern for the many residents of the area who fish, especially in Casey Canal.

Alabama: During winter wet weather conditions, shellfish harvest beds in Mobile Bay are closed periodically because of violations of water quality standards for bacteria. Oxygen demanding loads from critical storms must be reduced 35 percent to maintain 3 mg/l DO standard at all locations in Three Mile Creek.

New Mexico: Coliform standards will not be met on portions of Rio Grande River around Albuquerque due to urban runoff.

Oklahoma: Three lakes (Overholser, Arcadia, and Thunderbird) have problems related to urban runoff. Thunderbird Lake will be denied beneficial uses due to urban runoff.

Texas: In the Dallas area, Ray Hubbard and White Rock Lakes violate nutrient, pH, DO, and taste and color standards due to municipal discharges and urban runoff. Problems are anticipated in Lakes Lavon, Arlington, and Lewisville due to urban runoff. Violations of DO and coliforms on the Trinity River related to urban runoff are denying use for fishing and swimming.

Arkansas: High lead levels in streams and around Little Rock have been attributed to urban runoff problems.

Washington: In Snohomish County, uncontrolled drainage from urban areas causes flooding, erosion, sedimentation, destruction of fish habitat, increased levels of oil, gasoline, heavy metals, nutrients, pesticides, and destruction of the aesthetic value of streams. In Clark County, standards violations or high levels of bacteria, pH, dissolved oxygen nutrients, heavy metals and oil and grease make swimming unsafe and fish habitat greatly degraded.

Colorado: The South Platte River is impacted by urban runoff causing fecal coliform standards to be violated 60 percent of time. Violations of suspended solids, nutrients and bacteria standards limit recreation, fishing and irrigation. The Arkansas River is impacted by both urban runoff and agriculture causing parameters for suspended solids, nutrients, TDS and bacteria to be violated.

C. Other Nonpoint Sources

Mining

Mining operations can be highly disruptive to the environment, causing both surface and ground water pollution. Mining affects less than two percent of the land surface in any one of the 50 States, but the impacts on surface and ground water are much greater in area. Sedimentation and acid and alkaline drainage are the most serious, and common forms of water pollution from mining.

A national survey by State fish and game personnel indicated that almost every State had fish and wildlife habitat adversely affected by surface mining. The survey indicated that 13,000 miles of streams and 449 lakes and reservoirs having a surface area of 181,000 acres had been affected.

Figure III illustrates the extent and degree of nonpoint source pollution from mining activities.

States in the Appalachian region have a substantial number of their streams affected by acid mine drainage from coal mining operations. Table IV indicates the extent of water quality problems in major river basins in the region.

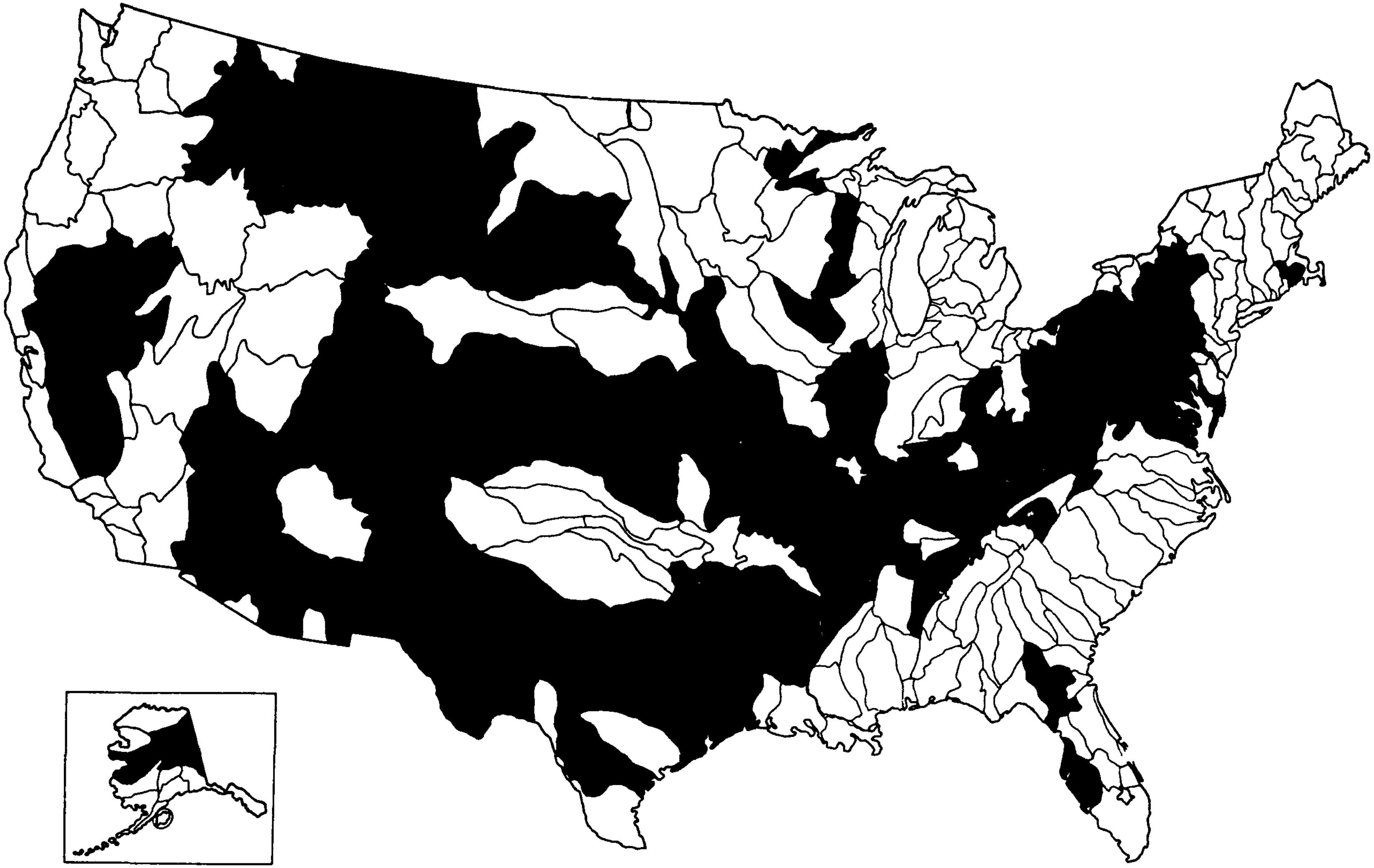
For example, Pennsylvania stated that 2,600 miles of its streams and rivers were continuously in violation of water quality standards as a result of acid coal mine draininge, and another 1,200 miles intermittently in violation. It reported that abandoned mine drainage, alone or in combination with other sources, accounted for 75 percent of the steam miles degraded in the State. The diversity of mining operations also results in a large number of potential pollutants.

In its 208 plan, California has identified about 200 miles of its streams in which water use is affected from inactive mining operations. While the extent of the polluted streams is limited, some of these abandoned mines are located in watersheds providing water supplies to portions of the San Francisco metropolitan area and others are located on State Park lands.

Construction

Construction activities impact about one million acres of land annually, and they remove vegetative cover, disturb soil foundation materials, and change topography and drainage. The resulting sediment is the principal pollutant, but construction may also contribute water pollution in solid form (asphalt, wood, fiber, metal) or liquid form (paint, oil, pesticides, and fertilizers). Acre-for-acre, construction activities are the largest contributors of sediment, averaging 100 tons per acre per year. Under the same rainfall and soil conditions, land under construction may yield up to 100 times the sediment coming from an equivalent amount of farmland.

FIGURE III
BASINS AFFECTED* BY POLLUTION FROM MINING ACTIVITIES



* In whole or in part

Note: Affected basins are shaded

SOURCE: NATIONAL WATER QUALITY INVENTORY, 1977, EPA

TABLE VI

MILES AND DISTRIBUTION OF STREAMS AFFECTED BY MINE DRAINAGE FOR THE APPALACHIAN REGION

			Miles of Streams Affected				Proportion of Area Streams Affected		Distribution of Polluted Streams	
	Area (sq.mi.)	Stream Miles[1]	Mine Drainage[2]			Acid Mine Drainage[3]				
			Inter.	Contin.	Total		MD	AMD	MD	AMD
Anthracite Region	4,200	6,300	350	260	610	567	9.6%	9.0%	5.8%	9.9%
Tioga	2,800	4,200	20	35	55	55	1.3	1.3	0.5	1.0
West Branch Susquehanna	6,900	10,350	600	540	1,140	1,035	11.0	10.0	10.8	18.0
Juniata	3,400	5,100	20	60	80	82	1.6	1.6	0.8	1.4
North Branch Potomac	2,200	3,300	40	130	170	172	5.2	5.2	1.6	3.0
Allegheny	11,730	17,590	87	979	1,066	1,055	6.1	6.0	10.1	18.4
Monongahela	7,400	11,100	289	1,382	1,671	1,665	15.1	15.0	15.9	29.0
Beaver	1,500	2,250	40	68	108	54	4.8	2.4	1.0	0.9
Muskingum	4,340	6,510	108	414	522	260	8.0	4.0	5.0	4.5
Hocking	1,200	1,800	141	223	364	90	20.2	5.0	3.5	1.6
Little Kanawha	2,300	3,450	25	5	30	---	0.9	---	0.3	---
Kanawha	12,300	18,450	544	859	1,403	148	7.6	0.8	13.3	2.6
Scioto	2,300	3,450	8	---	8	---	0.2	---	0.1	---
Guyandotte	1,670	2,505	11	288	299	70	11.9	2.8	2.8	1.2
Big Sandy	4,300	6,450	442	58	500	---	7.8	---	4.8	---
Ohio and Minor Tributaries	12,600	18,900	166	1,164	1,330	321	7.0	1.7	12.6	5.6
Kentucky	4,500	6,750	430	65	495	14	7.3	0.2	4.7	0.2
Cumberland	10,850	16,275	305	205	510	65	3.1	0.4	4.8	1.1
Tennessee-Black Warrior	28,000	42,000	---	---	155	84	0.4	0.2	1.5	1.5
		186,730	3,656	6,705	10,516	5,736			100.0	100.0

Source: EPA Studies in Appalachian River Basin

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[1] The total stream miles in these areas was estimated using 1.5 miles/sq. mile drainage density.

[2] "Inter." is Intermittently or Potentially: "Contin" is Continuously or Significantly; Mine Drainage is subsequently abbreviated MD.

[3] Acid Mine Drainage is subsequently abbreviated AMD.

Sediment yield in streams in developed areas averages less than 1 ton per acre annually. By contrast, areas undergoing urbanization have a yield fromm 2 to 200 tons per acre annually. Data collected on 175 areawide water quality management plans showed that 64 (36 percent) identified construction runoff as a water quality problem.

Silviculture

There is a clear need to maintain high-quality waters in forested regions, for otherwise, water supply costs would tend to increase and cold water fisheries would suffer. Many major cities, both in the East and West, have municipal water supplies located in forested areas. Trout and salmon fisheries depend on high-quality water from forested watersheds.

Sediment is the primary pollutant from silviculture, with sediment loss from forest lands estimated at less than four percent of the total man-made sediment in the Nation's waters. Chemical runoff from forest lands is a localized problem, since less than one percent of our forests receive chemical treatment each year.

Figure IV indicates those basins in which water quality has been affected by pollution from silvicultural activities. Recent events in Maine, Oregon, and California indicate States and local agencies and the public are becoming more concerned with pesticide and herbicide use and their affect in the environment. In Mendocino County California, in a recent referendum, residents voted by a 2 to 1 majority to ban use of 2,4,5-T and Silvex. Cancellation Hearings on these chemicals are scheduled in Washington, D.C. this fall.

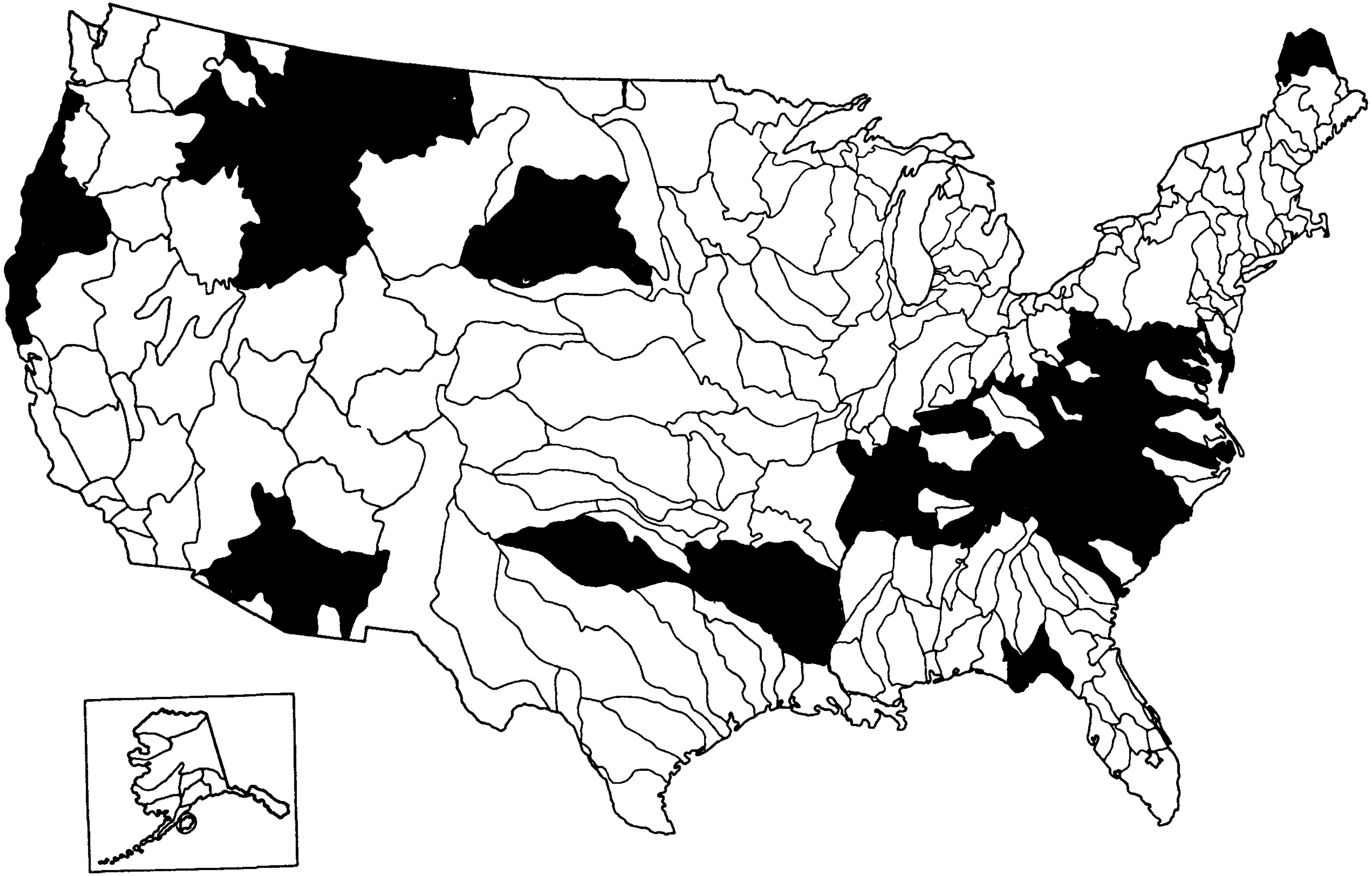
A number of States have identified problems resulting from silvicultural activities where poor management practices have been used. Some examples are:

Oregon: Eight priority areas having water quality problems related to silviculture (southwest part of North Coast Basin, Yamhill River, South Fork of Umpqua River, part of Goose/Summer Lakes Basin, Crooked River, Malheur River, Umatilla River) have been identified. Water quality problems involve erosion and sedimentation, excessive debris, high water temperatures, and algae growths.

Washington: Six priority areas having water quality problems (Willapa Bay, Kaloma River, part of Skykomish River, part of Snohomish River, Newaukum River, Deschutes River) were identified. Water quality programs involve sediment, temperature, and slash/debris.

Maine: A survey of 350 sites indicated that 10 percent have sedimentation problems causing localized stream impacts; 25 percent have excessive erosion. Spraying of Sevin for spruce bud worm control on 23 million acres has resulted in fish kills.

FIGURE IV
BASINS AFFECTED* BY POLLUTION FROM SILVICULTURAL ACTIVITIES



* In whole or in part

Note: Affected basins are shaded

SOURCE: NATIONAL WATER QUALITY INVENTORY, 1977, EPA

D. Ground Water Contamination

In general, ground water is a high-quality, relatively low-cost, readily available source of drinking water. Half the population of the country gets its drinking water--wholly or partly--from ground water supplies, and the use of ground water is increasing at a rate of several percent per year. Unfortunately, waste disposal practices, agricultural practices, and other problems have affected the quality and availability of ground water--and the potential for contamination appears to be increasing along with demand.

Ground water is especially important to people living in rural regions. Almost all (96 percent) of the nation's rural households are supplied by wells, and most of these are single family wells subject to few, if any, water quality safeguards. Approximately 67 percent of all ground water used is for irrigation, and 61 percent of all water consumed by livestock is ground water. Nearly a quarter of all the water used in the U.S. is ground water, yet nearly a quarter of that amount is "mined" from aquifers that cannot be recharged.

Over 17 million waste disposal facilities place over 1.7 trillion gallons of waste water into the ground each year. Some 98 percent of the facilities are septic tanks, but they account for less than half the liquid discharged. Ground water contamination occurs in local areas in all parts of the country, and occurs on a regional basis in some heavily populated areas.

The sources of ground water pollution are generally classified as nonpoint sources--septic tanks, farmland, industrial impoundments, agricultural impoundments, and oil and gas field activities are prime examples. The contaminants involved cover a wide range from nitrates to heavy metals, complex organic compounds and radioactive materials. The chart (Figure V) shows some of the major pathways by which contaminants enter ground water supplies.

Perhaps the most alarming aspect of ground water contamination is that removing the source of the contamination does not clean up the aquifer. Contamination may rule out desired uses of an aquifer for decades or centuries, since the natural clean-up processes that occur in surface water do not take place underground. Man's clean up techniques are limited in ground water and are generally extremely expensive, time consuming and often marginally successful. Therefore, protection of ground water quality requires effective management of nonpoint sources of pollution.

Ground water contamination has proved difficult to detect, since routine monitoring of aquifers is both difficult and expensive. Almost every known instance of ground water contamination has been discovered only after a drinking water source was affected.

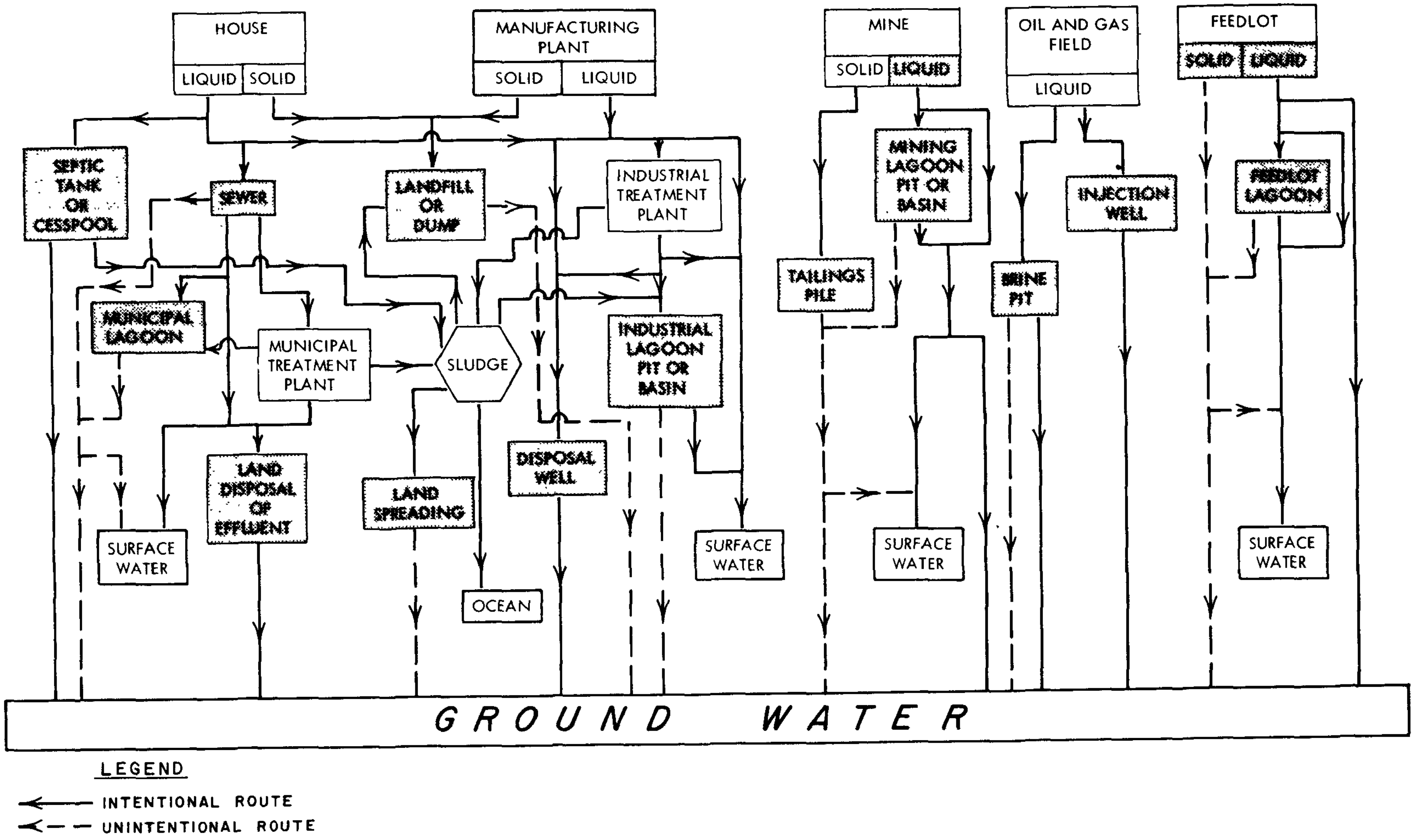


Figure V: Waste disposal practices and the routes of contaminants from solid and liquid wastes.

As efforts progress to clean up discharges of pollutants to the air and to surface water, more wastes--some of them toxic or hazardous--will be going onto the land in the form of liquids or residual sludges from other treatment processes. EPA has estimated 30,000-50,000 hazardous dump sites, many of which threaten ground water quality. It costs far less to place waste materials in a secure facility than it does to clean up the contaminated aquifer later.

When septic tanks are properly planned, constructed, located, and maintained, they are a safe, economical alternative to central sewage treatment and they use little or no energy. But when they are not properly used, or occur in high densities, septic tanks may contaminate with nitrates and pathogens the ground water supplies of the very communities they serve. At high concentrations, nitrates in drinking water may cause human health problems, such as methemoglobinemia (similar in effect to the "blue baby" syndrome in infants).

Surface impoundments of various types are one of the most widespread threats to ground water. Surface impoundments serve many waste dischargers--municipal, agricultural, and industrial--and contain all types of wastes from the most innocuous to the highly toxic. Few existing impoundments are lined; thus, slow seepage of contaminants is a significant threat to ground water quality.

According to one recent survey commissioned by EPA, there is a minimum of 133,000 sites where surface impoundments exist. Each site may contain more than one impoundment. Industrial impoundments are the most common (75 percent of the total) and are most numerous in oil and gas extraction and mining. Paper and pulp and electric utility industries operate the largest impoundments. Wastewater lagoons in industries using toxic chemicals, however, may present more immediate risks.

Municipal, commercial, and institutional impoundments comprise 10 percent of the surface impoundments. They are used primarily for processing and disposing sanitary wastes. Agricultural impoundments represent 15 percent of impoundments, and are used for handling wastes from animal feedlots.

A problem which is affecting ground water quality across the country is runoff from agricultural and urban areas carrying numerous contaminants into the ground water. Saline intrusion, primarily a problem in coastal areas--especially along the California coast, can be a serious ground water quality problem which is aggravated by overpumping.

Until recently, many agencies involved in water pollution control paid little attention to ground water--especially when faced with difficult and visible surface water problems. However, because of many local contamination problem and of well-publicized problems with industrial waste contamination of drinking water supplies in the East and nitrate contamination from agriculture and septic tanks across the country, State and local agencies are starting to identify ground water programs and attempt to develop solutions. Ground water outflows comprise a significant portion of the base flows/supplies of surface water bodies; thus contamination of ground water can have a direct impact on surface water quality. Because of this ultimate hydrologic relationship between surface and ground water, there is a need for States to expand their surface water quality programs to address the conjunctive management of surface and ground water quality.

Quantification of ground water contamination trends is not as extensive as for other quality problems due to very limited data. The following is a sample of ground water contamination problems in some of the EPA Regions:

Region I: A very important ground water situation is emerging in New England, especially in Connecticut and Massachusetts. The problems involve the shutdown of numerous public supply wells due to contamination from organic chemicals. It is possible that a significant portion of the ground water supplies for several communities will be lost.

Region II: Contamination of well supplies from organic chemicals is also a widespread problem in this Region. Several of the initial 208 plans in Region II focused on ground water protection. Extensive analyses was done on the Long Island ground water supplies. For 19 years, a Hicksville factory dumped millions of gallons of wastes containing a cancer-causing chemical into ground water recharge basins. As a result, 50 of the island's 950 wells had to be shut down in 1978. The local planning board also found that domestic wastes and urban runoff were threatening ground water.

Region III: Ground water contamination by nitrates, particularly related to septic system densities and commercial poultry operations, are major regional problems. Leachate from abandoned landfills has also threaten major water supplies.

Region IV: Florida is analyzing the impact of urban stormwater runoff on the Biscayne Aquifer, which is a sole-source drinking water supply.

Region V: Regional staff have experienced great demand for assistance in responding to emergency ground water situations resulting from spills and industrial waste disposal practices.

Region VI: New Mexico is experiencing problems with ground water contamination from uranium mining operations.

Region VII: Nebraska is experiencing high nitrate concentrations in ground water from agricultural activities. Kansas is considering ground water management legislation. The Karst topography in Missouri is having major problems with collapsing lagoons and waste disposal practices, and these conditions are being studied. A ground water supply in Iowa has been contaminated with cyanide from a landfill and from land spreading of sludge.

with nitrate contamination, either from septic tanks or from agricultural activities. The Region is also looking into possible ground water impacts from uranium mining and milling.

Region IX: Along the Pacific coast, California is having problems with nitrate contamination, pesticide accumulation, and overpumping of ground water and related salt-water intrusion problems. Arizona has major ground water problems from both a quality and quantity aspect. In Nevada, intensive ground water use is aggravating salt loadings to surface supplies.

Region X: Septic tank contamination of groundwater has resulted in housing moratoriums. Also, the use of drainage wells for the discharge of irrigation return water, storm water runoff, and septic tank fluids are causing ground water quality problems. Other problems are unwise use of sewage lagoons and spray irrigation for municipal sewage disposal, landfills, industrial waste lagoons, and land disposal of sludge.

E. Other Aspects of the Nonpoint Source Problem

Nonpoint source pollution is a problem not only because of its scope and the large number and amounts of pollutants involved, but also because of the associated economic, social, institutional, and political issues which are difficult to resolve. Some of the more important issues are the costs of nonpoint source control; the need for regulatory, as opposed to voluntary, control programs; and complications in water law. One possible benefit that could come from increased emphasis on nonpoint source control is energy conservation and production.

Costs of Nonpoint Source Controls

Best management practices, although they are generally less expensive than capital-intensive facility construction, nevertheless represent a significant demand on manpower and financial resources which must be added to, or diverted from, existing programs. While there is no overall estimate of nonpoint source control costs--partly because we have not identified all the problems--we do have information on the costs of individual activities in specific areas.

EPA's 1979 Construction Grants Needs Survey estimated the costs of structural urban runoff controls at over $60 billion. EPA hopes to find non-structural solutions to the urban runoff problem which are much less costly. (Some preliminary cost estimates for BMPs appear later in the testimony.

BMP implementation costs for agriculture have been estimated as high as $10 billion if all cropland and grazing lands are treated. However, it may not be necessary to protect the entire land resource to enhance or maintain water quality. A substantial portion of the more than 400 million acres in crop production may not require BMPs for water quality protection. The implication is that the ultimate cost of BMPs for water quality should be substantially lower than the cost of installing practices on all farm lands. Consider the following facts:

- The USDA National Erosion Inventory (December 1978) indicates that the average annual soil loss is less than three tons/acre in 20 States and less than five tons/acre in eleven other States. Thus, 31 States are within the prescribed target of five tons/acre, at least on average.

- Studies in the Great Lake Basin showed that 60 percent of the sediment load was generated from 30 percent of the agricultural land.

- The Black Creek, Indiana, study funded by EPA indicated that treating only 80 acres of highly erosive soils out of the watershed's 1600 total acres could reduce the total sediment load by 40 percent.

In terms of costs of control, mining pollution presents the most difficult problem. In some cases, technical solutions are not available within economic reason. The thousands of abandoned mines present a special set of economic and legal problems. In Pennsylvania, the State estimates that the cost of acid mine drainage controls would exceed one billion dollars and annual maintenance would be $38 million. An EPA study of the Monogahela Basin in Pennsylvania and West Virginia identified over 7000 mine sites, of which 2900 were producing polluting mine drainage. California identified 30 sites in its 208 plan, for which the cost of abatement was estimated at $20 million.

Regulatory versus Voluntary Programs

The application of BMPs for nonpoint sources differs from the application of point source controls in that management agencies must work with private citizens as opposed to local governments or corporations. In dealing with owners and operators of lands causing nonpoint source problems, the 208 program has used both regulatory approaches and voluntary programs.

Iowa, South Dakota, and Pennsylvania have all adopted regulatory controls for agricultural erosion and sediment problems. All States are subject to regulatory controls on feedlot discharges through the Clean Water Act. Sixteen States have erosion and sediment control laws for construction runoff, and the majority of the States have regulatory authorities for mining.

In the absence of regulatory controls, the voluntary control process appears to be working in the early stages of 208 plan implementation. The Model Implementation Programs (these are explained later in the testimony) which EPA and USDA initiated in 1978 have brought levels of landowner participation beyond our expectations. In the first seven prototype project areas, well over half of the farmers contacted agreed to implement the necessary BMPs.

For silvicultural pollution, both regulatory and voluntary programs are in use. The West Coast States (Washington, Oregon, California, Idaho, and Alaska) are using State Forest Practices Acts for implementing regulatory programs. These acts establish policies and authorities for meeting water quality requirements on public and private lands. In other parts of the country, however, State forestry agencies are implementing non-regulatory programs. These States have assured EPA that the voluntary system will work, and cite cooperative reforestation and fire prevention campaigns as examples of success. In the South and East, the institutional arrangements and good delivery systems exist to service many landowners with varied interests.

EPA and USDA are seeking a better understanding of the social and economic aspects of voluntary nonpoint source controls. An attitude survey is underway in Nebraska, and research is beginning to quantify off-site water quality benefits to downstream users. (The on-site costs and benefits of a given practice are fairly well known.)

Water Law

An issue of increasing importance, especially in the West, is the question of water rights. While this question has normally involved surface water issues in the past, both the increasing use of ground water and spreading ground water pollution problems make it imperative that we address both surface and ground water rights in the future. The States' water rights authority is well recognized. There will be no attempt to change water rights authority through section 208. However, EPA will work closely with the States as they identify problems in this area and address the institutional and constitutional problems regarding water rights. A number of States have recently made major decisions on water rights which enhance water quality use, including Idaho and Colorado.

Energy

The changing energy picture will have a great impact on the development of best management practices. Research in this area will need to be accelerated. In some cases, BMPs have a positive effect on energy use. For example, no-till, a method of planting which is very effective in reducing erosion, is much more energy and labor efficient than conventional tillage and planting methods. In some situations, it also produces higher yields. More study will be required to identify which soils are suitable for no-till and to determine whether there are significant adverse effects from the additional pesticides no-till methods require.

The Agency is funding a research project in California to determine whether animal wastes can be used to produce methane gas economically. Since these wastes have been contributing to water pollution problems in the State, a solution wil produce both water quality and energy benefits. Another area that holds promise for energy savings is irrigated agriculture. Many of the salinity problems in irrigation return flows result from too much water being used on crops. The most efficient BMP is to control water application, in some cases reducing it to less than half of the amount formerely used by the farmer. In those cases where pumping is needed to transport the water, the reduction in water use will save energy and enhance the water quality. This illustrates only a few of the current BMPS which can have a positive effect on energy costs.

III. AVAILABILITY OF BEST MANAGEMENT PRACTICES

While we recognize that data gaps exist, and that more information is required for the Water Quality Management program to be fully effective, we do have a large body of knowledge on nonpoint controls that is already being successfully applied. One of the initial steps in 208 planning was to determine the availability of Best Management Practices. Where it was determined that cost-effective BMP's existed, they were adopted in the plans and approved by EPA. Generally, they were practices which had previously been used by agricultural, silvicultural, construction, and mining operators to reduce sediment and water runoff. This previous experience provides strong assurance that they are the most feasible and cost-effective methods now available to solve some of the more easily identified nonpoint source pollution problems.

In beginning to implement the known BMPs, therefore, we feel that both private and public funds are being put to good use. On the other hand, there are many questions about BMPs which we have not answered and which are being addressed in our continuing planning program. I will discuss the data gaps in more detail later in the testimony.

A. Agriculture

Perhaps the most extensive knowledge is available for agricultural BMPs, since many of them have been used as soil and water conservation practices. A recent Cornell University report provides the most complete information available linking the effectiveness of soil and water conservation practices (SWCPs) to reduction in pollutants. Table VII indicates the effect of selected SWCPs on sediment losses from sample cornfields in Aurora, New York; Ames, Iowa; and Watkinsville, Georgia. The results indicate that SWCPs offer substantial control of sediment losses, primarily because they reduce cropland erosion. Runoff reductions are also given in the table, and it is evident that the practices are substantially less effective at controlling runoff than sediment. The differences in sediment and runoff reductions reflect variations in weather, soils, and management practices at the three locations.

The relative efficiencies of SWCPs for sediment control are best illustrated by estimates of their cost-effectiveness. In the Cornell study the cost-effectiveness of a SWCP was determined by comparison with conventional tillage and was defined as the reduction in annual sediment loading divided by the incremental annual monetary cost. Examples of incremental costs for grain corn are given in Table VIII. These costs are the changes in net farm income associated with the practices, and are sensitive to the effects of the practices on crop yields. Although

TABLE VII

EFFECTS OF SELECTED SWCPs ON RUNOFF AND SEDIMENT LOSSES IN THREE LOCATIONS*

	Reduction in Mean Annual Runoff	Reduction in Mean Annual Sediment Loss
	%	
New York		
Contouring	40	65
Terracing	60	95
Sod-based Rotation	70	70
Conservation Tillage	20	55
Iowa		
Contouring	15	55
Terracing	30	95
Sod-based Rotation	55	60
Conservation Tillage	30	70
Georgia		
Contouring	30	60
Terracing	40	95
Sod-based Rotation	30	60
Conservation Tillage	15	40

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*The Role of Soil and Water Conservation Practices in Water Quality Control, Cornell, University, 1979.

TABLE VIII

TYPICAL INCREMENTAL COSTS OF SWCPs FOR GRAIN CORN

SWCP	% Change in Crop Yield	Incremental Cost ($/ha-yr)
Contouring	0	10
Terracing	0	110
Strip-Cropping	+4[a]	95
Sod-Based Rotation	+4[a]	90
No-Tillage	+10	-65
	0	5
	-10	75
Conservation Tillage	+5	-35
	0	- 5
	-5	35

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[a] 1st year corn after sod.

it appears that most SWCPs have marginal impact on corn yields, no-tillage and conservation tillage are exceptions. These practices decrease yields on poorly drained soils but can increase yields on well drained soils. The incremental costs in Table VIII do not include the effects of SWCPs on long-term soil productivity. Control of soil erosion should increase farm income in the long run, but data is not available to quantify these benefits.

The Cornell study concluded that:

1. SWCPs significantly reduce edge-of-field pollutant losses in runoff. Reductions of solid-phase pollutants (sediment, strongly adsorbed pesticides, organic nitrogen, fixed phosphorus) are substantially greater than reductions of dissolved nutrients and pesticides. The magnitudes of pollutant reductions are site-specific, depending on local weather, soils and crop management.

2. SWCPs will not reduce total (runoff plus percolation) edge-of-field nitrate losses unless they also reduce fertilizer nitrogen applications.

3. Cropland erosion controls may not efficiently reduce sediment loadings to streams unless they are concentrated on lands with high sediment deliveries.

4. SWCPs often have negative or marginal short-term monetary benefits to the farmer. In many cases, however, conservation tillage and no-tillage can increase farm income.

5. Although SWCPs were not extensively compared with other pollution control measures, it is apparent that efficient management of chemical applications to croplands has significant potential for reducing pesticide and nitrogen losses. Although such management is not always operationally or economically feasible, it does provide a major alternative to the use of SWCPs for pollution control.

A more comprehensive summary of the principal available practices for controlling agricultural nonpoint source pollution, with brief descriptions of their effects, is contained in Table IX.

B. Urban Storm Runoff

BMPs available to help control pollution from urban runoff are practices that control litter, vehicular deposits, construction debris, and air fallout before they reach the receiving waters. Techniques identified in 208 plans include street sweeping, catch basin cleaning (both in swept and unswept areas), detention tanks, sewer flushing and

TABLE IX

PRINCIPAL PRACTICES FOR CONTROL OF AGRICULTURAL POLLUTION

Table Principal types of cropland erosion control practices and their highlights

Erosion Control Practice	Practice Highlights
No-till plant in prior-crop residues	Most effective in dormant grass or small grain; highly effective in crop residues; minimizes spring sediment surges and provides year-round control; reduces man. machine and fuel requirements; delays soil warming and drying; requires more pesticides and nitrogen; limits fertilizer and pesticide placement options; some climatic and soil restrictions.
Conservation tillage	Includes a variety of no-plow systems that retain some of the residues on the surface; more widely adaptable but somewhat less effective than E1; advantages and disadvantages generally same as E1 but to lesser degree.
Sod-based rotations	Good meadows lose virtually no soil and reduce erosion from succeeding crops; total soil loss greatly reduced by losses unequally distributed over rotation cycle; aid in control of some diseases and pests; more fertilizer-placement options; less realized income from hay years; greater potential transport of water soluble P; some climatic restrictions.
Winter cover crops	reduce winter erosion where corn stover has been removed and after low-residue crops; provide good base for slot-planting next crop; usually no advantage over heavy cover of chopped stalks or straw; may reduce leaching of nitrate; water use by winter cover may reduce yield of cash crop.
Timing of field operations	Fall plowing facilites more timely planting in wet springs, but it greatly increases winter and early spring erosion hazards; optimum timing of spring operations can reduce erosion and increase yields.
Plow-plant systems	Rough, cloddy surface increases infiltration and reduces erosion; much less effective than E1 and E2 when long rain periods occur; seeding stands may be poor when moisture conditions are less than optimum. Mulch effect is lost by plowing.
Contouring	Can reduce average soil loss by 50% on moderate slopes, but less on steep slopes; loses effectiveness if rows break over; must be supported by terraces of long slopes, soil, climatic and topographic limitations; not compatible with use of large farming equipment on many topographies. Does not affect fertilizer and pesticide rates.

Table IX, cont.

Contour strip cropping	Rowcrop and hay in alternate 50- to 100-foot strips reduce soil loss to about 50% of that with the same rowtation contoured only; fall seeded grain in lieu of meadow about half as effective; alternating corn and spring grain not effective; area must be suitable for across-slope farming and establishment of rotation meadows; favorable and unfavorable features similar to E3 and E9.
Terraces	Support contouring and agronomic practices by reducing effective slope length and runoff concentration; reduce erosion and conserve soil moisture; facilitate more intensive cropping; conventional _______ terraces often incompatible with use of large equipments, but new designs have alleviated this problem; substantial initial cost and some maintenance costs.
Grassed outlets	Facilitate drainage of graded rows and terrace channels with minimal erosion; involve establishment and maintenance costs and may interfere with use of large implements
Change in land use	Sometimes the only solution. Well managed permanent grass or woodland effective where other control practices are inadequate; lost acreage can be compensated for by more intensive use of less erodible land.

Table IX. cont.

Table Practices for Controlling Direct Runoff and Their Highlights.

Runoff Control Practice	Practice Highlights
No-till plant in prior crop	Variable effect on direct runoff from substantial reduction increases on soils subject to compaction.
Conservation tillage	Slight to substantial runoff reduction.
Sod-based rotations	Substantial runoff reduction and sod year; slight to moderate reduction in rowcrop year.
Winter cover crop	Slight runoff increase in moderate reduction.
Timing of field operations	Slight runoff reduction.
Plow plant systems	Moderate runoff reduction.
Contouring	Slight to moderate runoff reduction.
Contour strip cropping	Moderate to substantial runoff reduction.
Terraces	Slight increase to substantial runoff reduction.
Grassed outlets	Slight runoff reduction.
Contour listing	Moderate to substantial runoff reduction.
Change in land use	Moderate to substantial runoff reduction.
Construction of ponds	None to substantial runoff reduction. Relatively expensive. Good pond sites must be available. May be considered as a treatment device.

Table IX, cont.

Practices for the Control of Nutrient Loss From Agricultural Applications and Their Highlights

Nutrient Control Practice	Practice Highlights
Eliminating excessive fertilization	May cut nitrate leaching appreciably; reduces fertilizer costs; has no effect on yield.
Leaching Control	
Timing nitrogen application	Reduces nitrate leaching; increases nitrogen use efficiency; ideal timing may be less convenient.
Using crop rotations	Substantially reduces nutrient inputs; not compatible with many farm enterprises; reduces erosion and pesticide use.
Using animal wastes for fertilizer	Economic gain for some farm enterprises; slow release of nutrients; spreading problems.
Plowing-under green legume crops	Reduces use of nitogen fertilizer; not always feasible.
Using winter cover crops	Uses nitrate and reduces percolation; not applicable in some regions; reduces winter erosion.
Controlling fertilizer release or transformation	May decrease nitrate leaching; usually not economically feasible; needs additional research and development.
Control of Nutrients in Runoff	
Incorporating surface applications	Decreases nutrients in runoff; no yield effects; not always possible; adds costs in some cases.
Controlling surface applications	Useful when incorporation is not feasible.
Using legumes in haylands and pastures	Replaces nitrogen fertilizer; limited applicability; difficult to manage.
Control of Nutrient Loss by Erosion	
Timing fertilizer plow-down	Reduces erosion and nutrient loss may be less convenient.

Table IX, cont.

Practices for the Control of Pesticide Loss from Agricultural Applications and Their Highlights

Pesticide Control Practice	Practice Highlights
Broadly Applicable Practices	
Using Alternative pesticides	Applicable to all field crops; can lower aquatic residue levels; can hinder development of target species resistance.
Optimizing pesticide placement with respect to loss	Applicable where effectiveness is maintained; may involve moderate costs.
Using crop rotation	Universally applicable; can reduce pesticide loss significantly some indirect cost if less profitable crop is planted.
Using resistant crop varieties	Applicable to a number of crops; can sometimes eliminate for insecticide and fungicide use; only slight usefulness for weed control.
Optimizing crop planting time	Applicable to many crops; can reduce need for pesticides; moderate cost possibly involved.
Optimizing pesticide formulation	Some commercially available alternatives; can reduce necessary rates of pesticide application.
Using mechanical control methods	Applicable to weed control; will reduce need for chemicals substantially; not economically favorable.
Reducing excessive treatment	Applicable to insect control; refined previctive techniques required.
Optimizing time of day for pesticide application	Universally applicable; can reduce necessary rates of pesticide application.
Practices Having Limited Applicability	
Optimizing date of pesticide application	Applicable only when pest control is not adversely affected; little or no cost involved.
Using integrated control programs	Effective pest control with reduction in amount of pesticide used; program development difficult.
Using biological control methods	Very successful in a few cases; can reduce insecticide and herbicide use appreciably.
Using lower pesticide application rates	Can be used only where authorized; some monetary savings.
Managing serial applications	Can reduce contamination of non-target areas.
Planting between rows in minimum tillage	Applicable only to row crops in non-plow based tillage; may reduce amounts of pesticides necessary.

diversion berms. Many of the agricultural erosion and sediment BMPs can be adapted to construction activities in urban areas. Work to date has shown that the best results are obtained when a combination of techniques is applied to manage (1) runoff, (2) erosion, and (3) sources.

The following two charts illustrate BMP application for urban runoff. Figure VI is a summary of urban runoff management techniques, and Table X gives estimates of costs and effectiveness of various BMPs.

C. Other Nonpoint Sources

Silvicultural BMPs rely largely on practices which minimize soil disturbance and reduce runoff velocity. Most involve site-specific planning for timber harvesting, road construction, forestry practices, and protection of critical zones adjacent to streams. Silvicultural BMPs include:

- planning road and skid trail systems to minimize erosion; providing guidance on soils, slopes, streambanks, bridges, and road drainage
- selecting site-preparation techniques which minimize soil erosion; consideration is given to soil conditions, slope, vegetation, and other environmental factors
- protecting streamside management zones from destruction of ground cover and soil disturbance; BMP may include a prohibition of tracked and wheeled vehicles from the zone, or a requirement that trees cut in the zone be skidded away by cables

Specific BMPs to control nonpoint source pollution from active and abandoned mines are generally available. For active mines, many BMPs have been shown to be both economically feasible and more than 80 percent effective in preventing or reducing nonpoint source pollution problems--at least in particular locations or within particular segments of the minerals industry. Some of the most important practices available include:

- special handling of pollution-forming overburden, often aimed at isolating toxic materials from contact with water
- rapid soil stabilization through top-soiling, mulching, and revegetation
- water runoff management at disturbed sites through diversion, terracing, contour trenching, slope control, drainway construction, gradient control, and concentrated flow handling practices
- excavated ponds and sediment basins
- construction, maintenance, and closure of roads to prevent erosion and off-site transport of sediment

FIGURE VI

BMP: A SUM OF MANAGEMENT TECHNIQUES

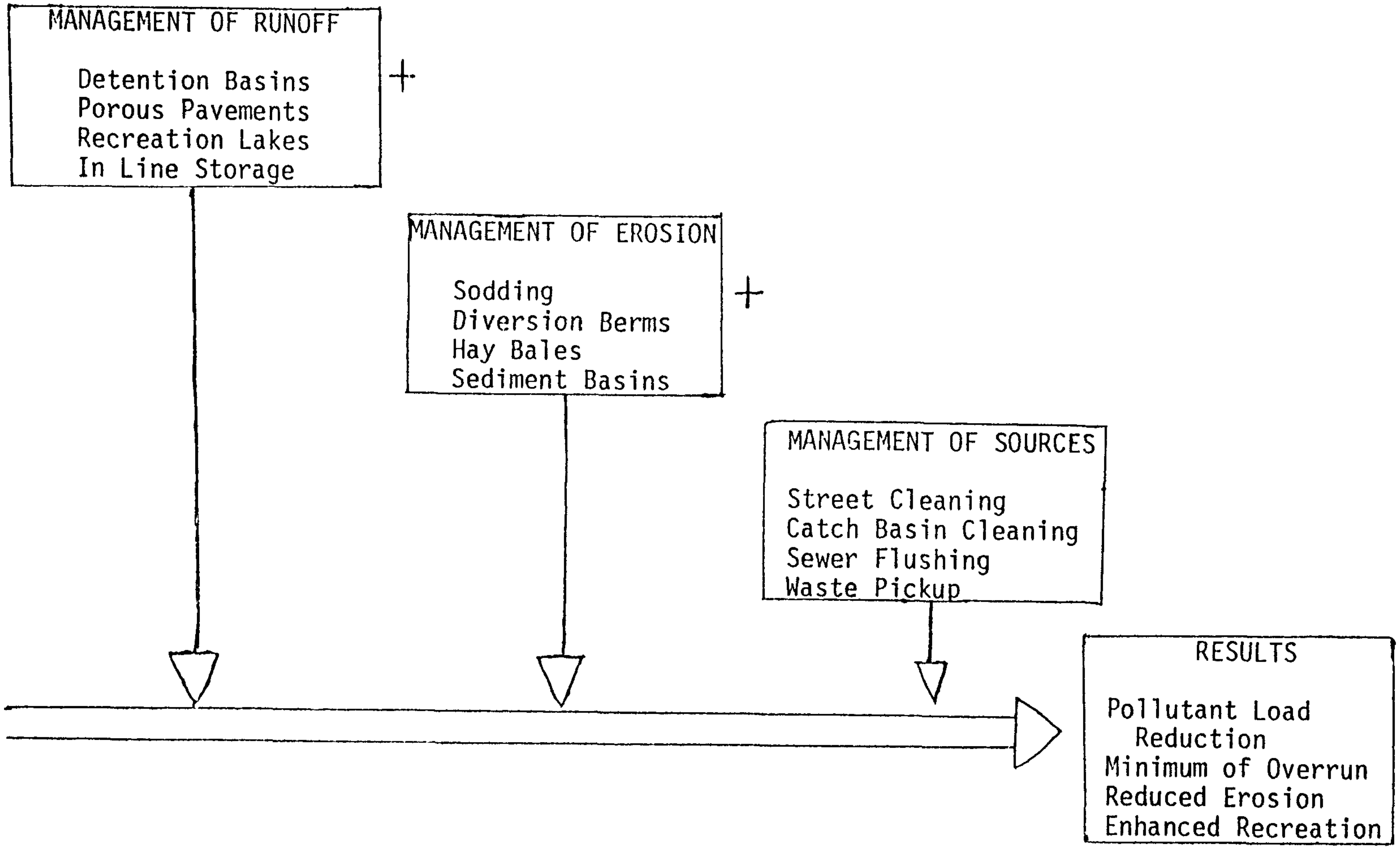

FIGURE VI: Schematic Example Of Best Management Practice in Urban Area.

TABLE X

ESTIMATES OF COST AND EFFECTIVENESS FOR BMP TECHNIQUES APPLIED TO THE URBANIZED U.S.

Technique	Annual Removal Suspended Solids (tons x 1,000)	Total Capital Required ($ x 1,000)	Annual O+M Required ($ x 1,000)
Street Sweeping	3,844	105,326	99,191
Catch Basin Cleaning (Unswept Areas)	19,900	--------*	51,450
Catch Basin Cleaning (Swept Areas)	130	--------*	438
Detention Tanks	299	4,675,926	93,517
Sewer Flushing	53	1,211,336	268,022
Diversion Berms	5,250	144,000	-----**
Total Costs And Effects	29,476	6,136,588	512,663

* assume cleaned by hand

** no data

BMPs for underground mining include:

- bore hole grouting and sealing
- preplanned flooding and shaft sealing
- application of surface mining BMPs to surface disturbances
- avoidance of post-mining gravity drainage, which often occurs from drift mines

BMPs for ancillary areas include:

- careful selection of waste disposal sites together with use of infiltration and leachate controls
- application of water runoff management controls, or collection and treatment, where needed to control nonpoint pollution

Abandoned mines present a special set of problems in controlling nonpoint source pollution. BMPs are generally available, but some problems are so severe that they are not amenable to solution other than direct treatment of runoff, perpetually.

D. BMPs for Ground Water Contamination

As discussed in the description of the ground water contamination problem, the most effective method for protecting ground water quality is to monitor and control the potential source of contamination--not the aquifer or the point of withdrawal. Often, when an aquifer becomes polluted, the only way to control the movement of contaminants is to restrict the withdrawal of ground waters.

Where waste disposal sites are located in critical ground water areas, treatment and containment of the wastes may be necessary. In someareas, land disposal is simply not a good idea, and alternatives must be considered--waste transport, resource recovery, ocean disposal, or surface discharges may be more sound environmentally. Regulatory programs designed to protect ground water quality must reflect a close relationship among land, surface water, and ground water programs.

An EPA survey of surface impoundments (June 1978) identified several actions that can be taken to prevent leachate from impoundments from polluting ground water. They are: impermeable liners; collection and recycling systems such as underdrains, infiltration galleries, and wells; retarding movement of contaminated ground water by means of hydraulic or physical barriers; or simply closing the impoundment.

Some States commonly issue various types of approval for different types of waste impoundments. These may be simple authorizations or very restrictive permits. Many States provide guidelines and requirements for siting, construction, operation, and monitoring of surface impoundments, but often the requirements apply only during construction, or they are not enforced. State programs are often hampered by manpower and budget deficiencies, inadequate knowledge by staff of the scope and nature of the ground water problem, or requirements which are not stringent enough.

Other BMPs which agencies can use to control ground water contamination are the same ones they would apply for surface water problems. Two examples are zoning ordinances which prohibit certain activities over ground water aquifers, and--for agricultural pollutant sources--irrigation scheduling and reduction of nitrate fertilizer application. For the control of salt-water intrusion, regulation of pumping and/or physical barriers are BMPs.

Septic control practices include better regulation of new systems, rehabilitation of old systems where feasible, prohibition of toxic septic tank cleaners, and management of existing systems by cleaning out the tank periodically. Density of septic systems is also becoming a major problem. Land use zoning for ground water protection, and revised fee schedules are being explored.

Local citizens and agencies on Long Island--where ground water problems are becoming critical--agreed on a comprehensive set of solutions ranging from sewer development plans and tighter industrial discharge controls to better septic tank maintenance, lighter use of lawn fertilizers, and safeguards for landfills. By choosing a minimum-sewer approach, the plan will keep the island's sewer construction costs down to $2 billion over the next 20 years--far below the $10 billion cost of complete sewering. This will also provide for necessary ground water recharge to maintain adequate level of supplies.

IV. FILLING DATA GAPS

In your letter of June 5, 1979 regarding this hearing, you raised a number of questions regarding nonpoint sources and water quality standards, our allocation process between point and nonpoint waste loads, how we measured natural NPS pollution and the need for better data and more monitoring. A primary objective in the continuing planning program will be to fill in the critical data gaps to build the basis for future controls on the more difficult nonpoint source problems. A recent GAO report* questioned EPA's ability to solve NPS problems without better data. The report called specifically for better data on cause-effect relationships.

EPA doesn't agree totally with the findings of the GAO report. We discussed our problems with the report in Mr. Costle's letter of January 12, 1979, to Congressman Bo Ginn, the former chairman of this Committee. Basically, in spite of the data problems, EPA is overseeing the implementation of BMP's now, and--at the same time--filling the gaps which the GAO identified.

We know that NPS pollution is a problem of serious national significance. Also, we know that controls and methods exist which will reduce the nutrient, pesticide, sediment, and coliform levels in NPS runoff. However, we lack information to evaluate the application of a specific BMP in a specific situation and the resultant improvement in downstream ambient water quality for the receiving waters.

For example, agricultural residues of nitrogen and phosphorous may enter surface and ground waters from runoff and leaching of animal wastes, fertilizers, and crop residues and from movement of sediments with adsorbed nutrients. However, the total amount of nitrogen and phosphorous lost to surface or ground water in any specific situation depends on many variables.

For cropland, these variables include application rates, soil properties, terrain, cropping practices, and rainfall amount, intensity, and duration. Many experiments have determined the amount of nutrients lost in individual agricultural situations, but we cannot predict how effective a particular BMP will be when applied to a particular farming enterprise when we have no previous data on that particular farm or receiving water.

We need to develop better understanding of these relationships so that we can make accurate predictions without having to collect specific BMP cause-and-effect data for each site.

Water quality standards provide the ambient requirements necessary to sustain the uses of the water resource to meet social needs. Water use classifications, which such standards support, are determined by a State through the public hearing process when standards are periodically reviewed. Pollutants introduced to a waterway from either point or nonpoint sources may affect the

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* The Comptroller General's December 11, 1978, report on the 208 program in which he noted that water quality management planning was not comprehensive and that serious data deficiencies needed to be addressed.

degree of attainment of water quality standards but such pollutant sources are not controlling in the development of ambient standards to meet water quality needs. Water quality criteria, which are designated in water quality standards to meet specific water uses, are developed from scientific information and are designed to provide for protection and propagation of aquatic life and for the protection of human health. Where the meeting of water quality criteria in water quality standards would result in widespread economic or social hardships, provisions are provided in the regulations for downgrading the designated water uses.

The determination of the use classification is based on "actual" or "attainable" water conditions. In this determination, the concentration of nonpoint source pollutants could be a factor when the pollutants associated with the nonpoint source: (1) represent a continuing input and are considered an existing condition and (2) exceed the concentration for the criteria specified for the water use in question. For example, in reviewing established standards, nonpoint source pollution may be considered in downgrading the designated stream use with a justification of man-induced irretrievable conditions.

The current approach to nonpoint source control has primarily been based on long term loadings and not on specific water quality parameters or standards.

Nonpoint source control programs are based on the use of best management practices (BMP's) which initially may not completely achieve water quality goals. An iterative process of tightening BMP requirements may be necessary to achieve this objective. Water quality criteria are based on water quality necessary to support a designated use, and therefore are equally applicable whether the load comes from point or nonpoint source discharges.

Water quality standards have been set by the States. This question of allowable inputs during design storm events is receiving direct attention through activities of EPA's Office of Research and Development where nonpoint source inputs are being defined as functions of storm hydrographs and where probablistic and statistical concepts are being explored. Office of Research and Development is also developing monitoring programs that preclude the need for continuous water quality sampling.

Studies are also underway to better define what constitutes adequate stream quality for a given use. For example, the EPA research laboratory in Corvallis, Oregon has a number of research projects ongoing which are designed to define the critical parameters for stream systems where the maintenance of a fishery is the desired use. In addition, the Model Implementation Program projects in South Carolina, Nebraska, Indiana and New York are being monitored with the same objectives in mind. In these efforts a total approach is being used and concepts such as streamside vegetation for temperature and sediment control are being integrated with instream habitat and water quality requirements. The objective is to improve the stream system to allow a desired use as opposed to the improvement in a single water quality parameter or the reduction of the annual load.

We also need more work done on NPS pollution occurring from natural sources. While the state-of-the-art is improving, our techniques are quite general.

One technique that is used is the comparison of current levels of a given parameter to background data available for that area prior to the existing land use, provided the previous use was a "natural" one. Comparisons to other areas can also be utilized in a similar way. One problem with this approach is that the available data are likely to be limited to low flow periods since little monitoring has been done on wet weather conditions, when NPS pollutants are normally transported.

Another approach that has been tried is the paired watershed concept where impacted and non-impacted areas are compared.

EPA has approached this problem in two ways: (1) EPA's Office of Research and Development has initiated studies which will seek answers to questions about natural conditions both through computer modeling and on-site techniques and (2) EPA in cooperation with USDA has initiated a series of demonstration projects in agricultural areas where project monitoring is being used to provide insight into these problems.

Our urban runoff program is currently in the process of assessing the nonpoint source contribution of pollution from urban runoff during rainfall and snowmelt events. Thirty cities are being studied to determine the magnitude, extent and type of water quality problems caused when rainfall washes the surface of our cities. The program is designed to determine what the relationship is between water quality degradation and urban runoff.

By establishing nonpoint source inputs the reductions in instream loads can be determined and natural levels established.

For natural materials, like sediment, which are pollutants only when present in sufficient quantity to impact a desired use, the distinction between natural and man-made conditions is particularly difficult because the sediment load is flow or energy dependent and relative contributions will differ. Sediment also represents an unlimited source and the volume transported will vary directly with flow.

Earlier, the testimony discussed the work being done on AWT projects, particularly our intensive analysis of waste load allocations to determine where AWT is required and where secondary treatment will meet the water quality goals. Although, historically, the orientation of most AWT projects revolved around a design at low flow conditions, the water quality impacts of a project at higher flows are now more generally considered. With the availability of 208 data and the growing emphasis on nonpoint source controls (including Clean Lake grants), comparisons of advanced wastewater treatment against nonpoint source contributions are now being done. In years past, most AWT projects were built before the problem or contribution of nonpoint sources was understood. The Headquarters Task Force on AWT review has noted that significant nonpoint source issues are identified in about 10 percent of the projects sent in for review.

At present, few precise quantitative NPS analyses are available. Accurate cost comparisons of point and nonpoint tradeoffs are seldom available. Thus, the importance of nonpoint source loadings will usually be qualitatively considered in the WLA process, until a better data base is assembled in the next (current) generation of WLA's.

There are three general types of wasteload allocation (WLA) studies where nonpoint sources of pollution could be a factor: flowing streams, lakes/ reservoirs and estuaries (tides). In these situations a critical or worst condition is used as a base of reference. The resultant WLA, if done to include NPS issues, reflects the most stressful environmental condition(s) under which point and nonpoint sources are collectively evaluated, for compliance with water quality standards.

In most free flowing systems, nonpoint sources are usually not a direct factor at low flow. Nevertheless, nonpoint source pollutants generated during higher flow periods can cause problems indirectly because of sediment deposits on stream and lake bottoms. These deposits may have a water quality impact during low flow periods by exerting a benthic (bottom) oxygen demand. This impact can be approximated quantitatively by benthic demand analysis and be quantitatively included in the WLA model.

During higher flow or runoff events, various methods are available to estimate the sediment loading to streams, lakes and estuaries. These estimates, allow conceptual comparisons that are useful for judging the general trade-off between point and nonpoint source controls. Later, when actual sampling and analysis of runoff is done, better analyses are possible. Quantification of overall loadings of soluble and insoluble nutrients as well as toxic loadings become very useful extensions of simple sediment estimates.

Nutrients can create problems in slow moving streams, estuaries, and lakes. The effects of nutrients on the dissolved oxygen profile of streams can, like benthic demand, be quantitatively approximated as part of the WLA model.

Lake models can similarly be prepared to assess the significance of nutrients on the DO of a lake. Lake models are highly complex and expensive. Most often annual nutrient budgets are calculated instead. From these budgets, or mass balances of nutrient input/output, the general state of the lake is determined. Prevention of eutrophication by a combined program of nutrient contols can have direct benefits since excessive algal decomposition will not occur on the lake bottom.

Many sediment loading estimates and nutrient budgets on streams and lakes have been made available through the WQM process. But, few estimates have been made for estuaries. Since estuaries are subject to tidal influence, the added complexity makes modeling very difficult and expensive. Mathematical techniques are available to deal with this complexity, but the models are difficult to comprehend and their accuracy is largely unknown. Allocations for estuaries including nonpoint sources are usually done on a qualitative basis. Gross allotments of nonpoint source loadings for broad categories of land use are usually calculated. For estuary-NPS studies, loadings are usually calculated at a combination of low (slack) tidal stage and rainfall (runoff). If nonpoint sources are ignored the design condition assumes that the critical event occurs when freshwater flow rates are at their lowest.

If a study area has suspected urban, agricultural, or other nonpoint source runoff problems, they should not be ignored. For nonpoint source runoff assessments a design (critical) rainfall event is chosen to generate the nonpoint source sediment loadings. These loadings are then factored into various runoff models, which generate loadings for nutrients, oxygen demand and other parameters. These loadings, in conjunction with a point source inventory and water quality impact models, can then be used to approximate water quality standards violations at low <u>and</u> high flow.

There is little question that more accurate data, more monitoring, and refined analytical tools are desirable. Generally, the problems to date have been identified by using limited data, and observations. For example, all point source discharges to a stream are being controlled but the historic or desired use of the stream has still not been restored--it's still eutrophic, there are no fish, or the coliform counts are too high for safe bathing. We are working to meet these needs in a number of programs in the Agency, including more intensive surveys by EPA monitoring teams, additional research, and emphasis on better data in the 208 and Clean Lakes programs.

Free flowing systems present the real problem because we do not have acceptable methods of measuring the "health" of the system relative to NPS loading. Methods do exist to identify degraded areas resulting from point source inputs but it is not clear, as yet, whether these are applicable to diffuse sources.

Probability and statistical theory are adequately developed to be used to address the problem. However, there is an absence of data from which to develop approaches that can be proven to be adequate and thus accepted by the technical community. More important, at this point, is having adequate data to demonstrate in a quantitative manner the extent to which nonpoint source problems exist and to show by example that their control is not beyond reason.

EPA has undertaken this latter task through the use of prototype projects in urban runoff, agriculture, silviculture, and ground water. Progress (i.e., the restoration of degraded aquatic systems) is being made. The most dramatic success is with impoundments or lakes where the mass balance or long term loadings approach works and where acceptable methods of measuring the "health" of the system exists.

Lake restoration grants to the Cobbossee Watershed District (ME) and to Moses Lake (WA) are examples where positive results have occurred. In Maine the project resulted in an animal waste management program in the watersheds of three eutrophic lakes. This, in combination with a nutrient inactivation project, will significantly reduce nutrient loadings to these lakes. In Moses Lake the controlled release of dilution water during the spring-summer season has resulted in water quality improvements that are significant and actually greater than expected.

Another prime example is Skinner Lake located in Noble County, Indiana, where a variety of NPS controls are being applied to control the input of sediment and attached phosphate to the lake. The project utilizes the joint resources of USDA and Indiana-Purdue Universities at Fort Wayne. This project concentrates on: (1) controlling septic tank effluents, (2) controlling nutrient and sediment inputs, and (3) removal and inactivation of nutrients by weed harvest and chemical treatment.

As stated earlier, we have sufficient knowledge in many areas to proceed with BMP implementation and are doing so. The continuing 208 program will focus on those data gaps where more information is needed before we embark on a costly nonpoint source control program.

V. NONPOINT SOURCE RESEARCH

EPA's goals for nonpoint source research encompass most of the research needs identified above. Our first goal will be to understand further the complex relationship between nonpoint source pollutant discharges and the quality of the affected waterways. Here, particular emphasis will be placed on the effects of toxic pollutants. Our second goal will involve the development and evaluation of cost-effective management methods to limit pollution from nonpoint sources. This goal will address structural as well as nonstructural approaches to the control of these pollution sources. Finally, our third goal for research will focus on the development and demonstration of effective implementation strategies for nonpoint source control methods. This research goal is needed for the development of improved voluntary acceptance approaches to the use of control methods for nonpoint sources.

A. Understanding How Nonpoint Sources Impact Water Quality

Our first task will be the development of methods to evaluate the physical, chemical, and biological water quality impacts from the discharge of nonpoint source pollutants from urban runoff and agricultural production. Here techniques will be developed which relate climate conditions and urban and rural land use activities to enable the prediction of the total amount of pollutants discharged to a receiving stream. (Other nonpoint sources such as forestry activities will receive attention in the future.) This information will then be used to obtain criteria for the level of nonpoint pollutant discharges allowable for specified water uses.

In addition, monitoring techniques will be developed to measure the amount of nonpoint source pollutant discharges.

B. Research Will Aid in Determining the Most Cost-effective Method of Meeting Established Water Quality Standards

Some of this research will improve our capability to monitor and predict both the quantity and quality of precipitation and should therefore assist in the evaluation of watershed impacts caused by acid rain. Here, we plan to focus on impacts in the following general areas: aquatic environments, soils, agriculture, forestry, natural ecosystems, and long term trends.

Finally, we will address the relationships between point and nonpoint source pollutants on an individual watershed basis. This research will aid in determining the most cost-effective method of meeting established water quality standards. As part of this work, methodologies will be developed for determining allowable discharges for both conventional pollutants (such as organic matter, suspended solids, and fecal coliform) and toxic materials based on land use, climate, soil types, and pollutants for an entire watershed.

C. Methods for Controlling Nonpoint Source Pollution

The first step here will be to evaluate the effectiveness of existing methods to control conventional as well as toxic nonpoint source pollutant discharges in a watershed. Since local conditions may be such that more than one nonpoint source control method is required, various combinations of methods will be evaluated. Methodologies will be developed to match the most appropriate control method or combination of methods to a given set of local problems. In line with this approach, we will publish guidelines for planning. conducting, and evaluating field demonstrations of nonpoint source control methods to assist State and local water quality management agencies in developing effective nonpoint source control programs.

Because nonpoint source control for agriculture and silviculture is a voluntary program, it will be crucial that users in the field be aware of the latest developments. To this end, we will evaluate information transfer mechanisms currently available for nonpoint sources to determine their effectiveness in reaching the user community. In the years ahead, these mechanisms will play a major role in the transfer of nonpoint source assessment and prediction capabilities, results from demonstration studies, and improved or new management concepts to the field.

As a final task, we will demonstrate and evaluate new or improved control methods which have been developed by other Federal and State agencies. Particular emphasis will be placed on those methods which are appropriate for multiple uses. Since accurate and timely information will be needed by State and local management agencies during the implementation phase of nonpoint source control programs, we will also develop an information system to retrieve water quality monitoring data on the effectiveness of nonpoint source controls.

D. Implementing Nonpoint Source Controls

In order to improve our capability to implement nonpoint source control programs, EPA's research will focus on the development of relevant economic impact data, the analysis of existing institutional mechanisms, and opportunities to integrate nonpoint source control programs with other pollution control programs. Special attention will be paid to economic impacts at the local, regional, and national levels for agricultural and silviculture nonpoint source control methods. Here, various incentives also will be investigated to determine those that are the most feasible and appropriate for local problems and conditions.

Second, we will evaluate the effectiveness of existing institutional mechanisms in encouraging the use of nonpoint source control methods. Current laws and regulations will be reviewed to identify impediments to effective nonpoint source control. Educational programs will be assessed and successful examples of voluntary implementation of nonpoint source controls will be evaluated and documented.

Finally, we will investigate opportunities to integrate nonpoint source control efforts with other pollution control efforts.

VI. PROGRESS IS BEING ACHIEVED IN THE CURRENT PROGRAM

After five years of 208 planning, it is reasonable to ask about progress. What measure of success has been attained? Given that NPS pollution is a major national problem, that certain data gaps need to be filled, and that many feasible BMP's already exist for controlling NPS pollution, what is EPA's strategy for solving the NPS problem?

Many of the pollution problems first identified in 208 plans are on their way to being solved. The continuing program strategy has increased emphasis on providing solutions to site-specific priority problems in each planning area. Activities under the continuing program include the preparation of ordinances and legislation; the preparation of site-specific plans (e.g., diversion structure for mine drainage control); analysis of manpower requirements and methods of financing and allocating costs for implementation; presentations to public groups and decision-makers (e.g., city councils and State legislatures) for appropriate action. In essence, the program is taking planning recommendations through the political process to implementation.

In addition, on selected projects, EPA is funding detailed monitoring and evaluation of BMPs being implemented. EPA has placed increased emphasis on these prototype projects to define the extent of the problems, identify cost-effective solutions, and provide a technical base for controls. The highest national priorities for 208 funding are urban storm runoff, agricultural pollution, and ground water protection. To expedite solutions, EPA will continue problem-specific technical assistance contracts with technical experts to assist EPA, the States, and other agencies with their difficult NPS problems.

EPA is now relying on prototype projects to develop cost-effective controls on selected sites for transfer to other sites. Information transfer is a key aspect of the strategy because of the limited monies available to monitor and evaluate each project. EPA recognizes that only a certain level of information is transferrable and that it must be tailored to each exact situation. To enhance the potential of information transfer, EPA has selected prototype projects in a variety of settings with different types of receiving waters, designated uses, possible controls, and involved pollutants.

EPA has also made several modifications in policy and in management to improve the program. These changes are discussed later in this testimony.

A. Point Sources

Since early planning was centered on point sources, we could expect results to be most obvious in this area. And they are. In the initial stages of this program, major efforts were directed to resolving population projections, sewer capacities, and service areas and developing facility plans. By November of this year, an area must have an approved 208 facility plan prior to continuing construction grant funding.

We have saved more money by reducing costs for municipal waste treatment facilities through 208 planning than has been appropriated for section 208 to date. Several examples follow:

New Castle County 208 Agency (Wilmington, Delaware): An evaluation of proposed sewer extension plans to provide service to homes with septic systems included a determination of on-lot disposal methodologies considering environmental constraints such as soil type, topography and hydrology. The 208 plan developed a priority list for septic system needs which identified those areas most in need of sewering and those areas suitable for continued operations of on-lot disposal systems. The County revised the Capital Improvement Plan to include only those areas in need of sewering, resulting in a $2 million cost savings. In addition, an approved sludge pipeline was abandoned upon examination of sludge disposal alternatives, for a $9 million cost savings.

North Beckley and Bruceton Mills, West Virginia: Revised waste load allocations helped tailor municipal wastewater treatment technology to local receiving stream conditions. In North Beckley, the original allocation set limits of 10 mg/l for BOD_5 and 3.2 mg/l for TKN. The treatment selected to meet these limits was an oxidation ditch followed by a nitrification unit. The new limits are 30 mg/l for BOD_5 and 18 mg/l for TKN. It is anticipated that only an oxidation ditch is needed to meet this requirement and, therefore, no nitrification unit is needed. This results in a capital cost savings of $1,900,000. In Bruceton Mills, the original allocation set limits of 12.0 mg/l for BOD_5 and 3.2 mg/l for TKN. Treatment required to meet this limitation is extended aeration followed by nitrification and filtration units. The revised allocation is 25 mg/l for BOD_5 and 6.9 mg/l for TKN. It is anticipated that at least the filtration unit may be omitted within the facility to meet the revised limitations. This results in an approximate savings of $30,000 in capital costs.

Solomons Island, Maryland: The original wasteload allocation set limits of 20 mg/l for BOD_5 and 10 mg/l for SS, based on old State policy of requiring filtration for all discharges into shellfish waters. The State reassessed this project, and the allocation was changed to secondary treatment (lagoon).

Mississippi (Small Communities): Mississippi, like several other southern States, presently has numerous small communities which use oxidation ponds as the primary wastewater treatment system. The Clean Water Act and State water quality standards are such that oxidation pond systems cannot comply with their requirements. It appeared, therefore, that all of these small communities would be faced with the installation and operation of expensive "concrete and steel" treatment plants.

Early in the State 208 program it was decided that a major effort to determine a better method to design and/or operate oxidation ponds should be undertaken. Although some additional limited study is still proceding, the results of the initial studies are beginning to be implemented through the 201 construction grants program.

There are presently about 252 oxidation pond facilities of less than 2.0 MGD in Mississippi alone. A rough estimate of potential cost savings to these municipal facilities by installing the recommended hydrologic controlled release oxidation pond system rather than biological "concrete and steel" systems is $25,000,000 in construction cost alone. If these same facilities were all required to install facilities designed to meet water quality standards in small low flow streams, the potential savings of construction costs would be approximately $100,000,000.

Thus it appears that construction cost savings in the range of $25,000,000 to $100,000,000 can be attributed to a study element of the Mississippi Air and Water Pollution Control Commission 208 plan, which was executed at a cost of $143,700 from Federal 208 funds.

Mississippi (Gulf Coast Region): After a moratorium was declared on wastewater discharge permits in the Gulf Coast area, action was initiated to develop a cost-effective wastewater facility plan for the Gulf Coast region. The facility planning efforts were partially funded by two separate grants under step one of the Construction Grants Program (section 201). The plans were actually developed under individual agreements between each of the nine municipalities and three counties and their individually selected consulting engineers. Coordination of these separate planning efforts proved difficult, and it became apparent that a central focus was required to tie the planning program together.

The Mississippi Air and Water Pollution Control Commission, through the statewide 208 program, was the mechanism used to resolve problems experienced in the 201 program. The study resulted in a certified plan for the Gulf Coast that establishes a regional treatment scheme for the three county area. Although capital construction costs have actually increased as a result of higher required levels of treatment identified during the 208 process, significant cost savings have resulted from enactment of State legislation that establishes an interim regional commission to implement the Gulf Coast Plan.

Cost savings will be realized in two areas: (1) reduced interest rates available to the regional authority; and (2) improved management capabilities. Because of the regional commission will be authorized to collect a 2 mill tax as a standby method of generating revenue, its bonding capability will be significantly increased above that of individual communities (in the 208 plan, a financial analysis showed existing bonding capability of several municipalities was inadequate to finance treatment plant construction). Also, the interest rate in the bond market for the regional commission should be about 1 percent lower than that obtainable by individual municipalities. Based upon a local share of about $31,000,000 that would be included in the initial bond sale, this results in a cost savings of approximately $7,500,000 over the life of the bonds. A comparison of costs for centralized versus decentralized operation and maintenance of treatment and interceptor facilities showed that cost savings of $3,700,000 over a twenty year period could be expected. Actual services at existing plants (dencentralized operations) should be significantly improved as a result of the regional operation (centralized operations).

North Carolina: The North Carolina 208 process identified, evaluated, and is nearing implementation of a management practice which will result in a conservative savings estimate of $3,000,000 per year in operation and maintenance costs. The practice, seasonal effluent limitations, would provide increased discharge of oxygen consuming wastes (BOD and NH3 -N) during the winter months (November thru March). During this season, high stream flows and low temperatures allow for greater natural assimilation of oxygen consuming wastes. The summer period (April thru October) is the critical season in relation to the effects oxygen consuming wastes have on natural waters; however, it is also the period when oxygen consuming waste treatment is most effective.

The management practices analysis was developed into regulations which allow winter season effluent limits to exceed summer effluent limits by as much as a factor of two. In addition, a benefit-cost study of the seasonal effluent limits showed no significant social or environmental costs but considerable economic savings.

For example, for one city with a 16 MGD facility, the savings were estimated at $9,000,000 for capital costs and $250,000 for operation and maintenance costs. It is estimated that design modifications, more accurate accounting of industrial savings, and other factors could easily make actual savings in the $5,000,000 to $10,000,000 per year range for North Carolina.

Nashville, Tennessee: Work conducted by the Nashville 208 agency, the Mid-Cumberland Council of Governments and Development District, led to substantial cost savings for construction of one of the area's sewage treatment plants. The Dry Creek Sewage Treatment Plant, with a design flow of 12.3 MGD, had been given effluent limits by the State of Tennessee of 20 mg/l for BOD5 and 5 mg/l for NH3 -N, corresponding to secondary treatment levels with nitrification. Field data collected by the 208 study was utilized to calibrate a computer model. The results of the modeling indicated that straight secondary limits for this plant would be adequate to protect the instream standard for dissolved oxygen. After much discussion between the 208 agency, EPA, and the State, the effluent limits of the facility were reduced to straight secondary treatment levels. The estimated cost saving in capital construction costs is approximately $3 million dollars.

Knoxville, Tennessee: Several years before the start of the 208 program, the City of Knoxville received a court order to expand and upgrade existing treatment facilities. A recommendation for a regional facility received strong opposition. A plan was finally developed for expanding of two treatment facilities and upgrading them to tertiary treatment. Water quality analysis for the 208 program indicated that municipal point sources are the most serious pollution sources in the Knoxville area. Further modeling under the 208 program showed that incremental improvement in water quality from secondary to tertiary treatment was negligible. The solution developed on the basis of these findings was to expand and upgrade the Third and Fourth Creek Sewage Treatment Plants to better than secondary treatment for some constituents but to secondary treatment as adequate for others. The Tennessee Water Quality Control Division and EPA reduced effluent limits accordingly. The revised plans for upgrading of facilities in Knoxville will result in almost the same degree of improvement in water quality and a cost savings of $2 million to $3 million.

First Tennessee-Virginia Development District (Johnson City, Tennessee): Briston, Virginia, Briston, Tennessee, and the outlying areas of Washington County, Virginia, were covered by two separate, poorly coordinated 201 plans which proposed three new treatment facilities for the area. The mayors of the two towns are on the 208 Policy Advisory Committee of the First Tennessee-Virginia Development District. The 208 staff reviewed the 201 plans and found that one regional facility would be more cost-effective.

The mayors and members of the Boards of Commissioners for the two cities and a representative from the county are meeting regularly with the 208 staff. Agreement has already been reached on upgrading an existing facility to serve as the regional facility and the project is underway. This single facility will result in a cost saving of approximately $42 million, including $30 million for construction of one of the proposed new plants and $12 million from upgrading the existing plant rather than constructing a new facility.

Chattanooga, Tennessee: The water quality work conducted by the Chattanooga 208 agency has resulted in a substantial cost savings to the residents of the area and the U.S. Government. The Moccasin Bend Sewage Treatment Facility was given effluent limits by the State of Tennessee which required treatment levels of 30 mg/l for BOD_5 and 5 mg/l for NH_3 -N. The water quality modeling efforts of the 208 study showed that an ammonia limit of 5 mg/l was not necessary to meet dissolved oxygen instream standards. The size of the facility involved is 90 MGD, and the estimated cost savings are in the $20 million range. Construction is currently underway on this facility.

Volusia County COG (Daytona Beach, Florida): Water quality analyses performed by the 208 agency in the Volusia area led to reduction of treatment requirements from AWT to secondary for discharges to the lower Halifax and Northern Indian Rivers with no significant effect on water quality.

Myrtle Beach, South Carolina: The Myrtle Beach waste water treatment facility was modified after modeling studies funded by 208 determined that if the discharge was combined with another plant, effluent requirements could be reduced to secondary.

Arkansas/Louisiana: The most significant cost savings in water quality activities which will be realized in Arkansas and Louisiana as the result of 208 planning is the development of a policy pertaining to point source discharges to intermittent streams, man-made water courses, and nonpoint source dominated streams. As a result, many dischargers--now required to provide AWT/AST because of the way the Arkansas and Louisiana water quality standards are written--would need to provide only secondary treatment. This has a potential for saving millions of dollars in in both capital costs and operation and maintenance costs. In addition, this would provide more protection for the environment since many of the affected dischargers are very small and would be unable to operate a sophisticated treatment plant properly.

Indian Nations COG (Tulsa, Oklahoma): INCOG was able to demonstrate, as a result of the 208 monitoring program, that chlorination of the effluent of Broken Arrow's wastewater treatment plant was not environmentally necessary, and this resulted in a savings of $63,000 in construction costs and undetermined savings in O&M costs.

North Central Texas COG (Arlington, Texas): AST, rather than the originally-proposed AWT, will be required of wastewater treatment plants on the Trinity River. A large cost-savings (approximately $100 million is anticipated). Continuing monitoring will identify future treatment levels.

Mountainland AOG (Utah): Water quality information from 208 planning indicated that a reduced level of wastewater treatment was adequate to meet standards. Eliminating sand filters on the Timpanogos Regional Treatment Plant will save $1.5 million in capital costs (1976 dollars). In addition, regionalization recommended by the 208 plan eliminated three small plants resulting in a savings of $2.04 million in capital costs and $112,000 in annual O & M costs.

Salt Lake County 208 Agency (Utah): Water quality information funded through 208 indicated that a reduced level of wastewater treatment was adequate to meet standards. Plant regionalization in the Jordon Valley (seven existing plants combined into two regional plants) will save $18 million in capital costs and $900,000 in annual O & M costs.

Larimer-Weld COG (Colordao): A consultant, performing work under a 201 grant for the rural towns of Frederick, Firestone and Dacona, recommended an activated sludge system with an estimated price tag of $2.7 million which would have imposed an exorbitant monthly cost on the citizens of this low population area. The 208 planning agency, concerned about the monthly cost, developed an alternative plan which resulted in an estimated yearly assessment of well less than $200 per tap with a lagoon system while still meeting permit conditions.

Pikes Peak COG (Colorado): The 208 planning agency conducted an in-depth study of a septic tank problem in the Ute Pass Development. The agency determined the problem not to be as significant as thought, resulting in a savings of $3 million in central sewage collection and treatment systems.

Denver Regional COG (Colorado): The use of the COG's population projections by local government for wastewater treatment facility design will result in a potential savings of $100-200 million. The planning agency's projections (2-2 million) were significantly lower than the local figures (combined 4.0 million).

Southwest Wyoming 208 Agency: Some towns have taken facilities plans developed under this 208 grant and proceeded without financial assistance to develop plans and specifications, and in at least one case (Mountain View), construct the facility without EPA funds. Cost savings to EPA was more than the cost of the initial 208 grant ($415,000).

Phoenix, Arizona: Phoenix had population projections varying from 1.9 to 3.0 million people and had 9 existing service areas. A population projection of 2.2 million was adopted, which resulted in smaller treatment facility requirements. The facility plan examined phasing of facilities, better utilization of capacities, and consolidation of service areas to six. These findings resulted in a $15-20 million construction cost savings plus undetermined savings in O & M.

Southeast Idaho COG (Pocatello, Idaho): A joint municipal/industrial land application project for water reuse was recommended by this 208 agency. The industry is a fertilizer manufacturing plant that discharges to the Pocatello municipal treatment system. This phosphorus rich effluent will be applied to cropland in the area. The proposed AWT facility would have cost $9 million. The cost of the proposed land application system will be $6 million, resulting in a $3 million capital cost savings. O & M cost savings of at least $900,000 annually will also be realized. The AWT facility would have cost $1.5 to $2.8 million annually to operate, while the cost for land application will be about $600,000.

Mid-Willamette Valley COG (Salem, Oregon): MVCOG developed and implemented regional projections for population, land use, and wasteloads in the three counties and 33 incorporated cities within the Region. This resulted in a documented municipal treatment facility construction cost savings of an estimated $1,466,000 for four cities in the Region.

Lane Council of Governments (Eugene/Springfield, Oregon): The City of Eugene, the City of Springfield, and Lane County signed a joint Powers Agreement establishing the Metropolitan Wastewater Management Commission. The new commission was created to construct, operate and maintain regional sewerage facilities for the Eugene-Springfield Metropolitan area. Financial and technical assistance and political mediation, which were part of the 208 effort, helped realize a $3 million cost savings through regionalization of sewerage treatment facilities.

B. Advanced Waste Treatment/Waste Load Allocations

A limited number of proposed AWT projects will be selected for detailed analysis in the 208 program. These will generally be projects which have more complex institutional and political problems (multi-jurisdictional) and could not be resolved in a single community. Since in FY 80 we will not utilize 208 funds for point source planning--such as these AWT decisions--we will utilize construction grant funds through interjurisdictional agreements as required.

The objectives of the AWT planning program are to assist municipalities States and EPA in improving the methodologies and guidance for wasteload allocations, including the impact of nonpoint source pollution and to assure that economic factors are fully assessed so that better AWT decisions will be made.

A list of the initial projects to be evaluated in the 208 program appears in Table XI.

C. Agriculture

Until the 208 program was initiated five years ago, little attention had been given to agricultural sources of pollution. While agricultural activities were generally thought to cause water quality problems in many lakes and streams there was, and still is, a lack of adequate data on the extent of the problem and the controls required to correct or prevent it. Many of the answers we need will take both time and money. However, we have made progress in the agricultural nonpoint source area. As a result of the initial findings of the 208 program, most States have identified those areas which have the most critical agricultural nonpoint source problems.

We have made full use of the expertise and resources of USDA to assist us in implementing agricultural nonpoint source controls. Their agricultural delivery system is both widespread and effective. Many farmers and ranchers have applied conservation measures on their lands for years. Our objective is to accelerate that progress in critical water quality areas and provide more information to land owners regarding more effective BMPs.

Working with the U.S. Department of Agriculture, EPA selected seven critical areas, out of 50 identified by the States, to carry out an accelerated program of water quality management, measure the results, and provide some of the information on nonpoint source pollution that is lacking. This program, which is named the Model Implementation Program (MIP) has these objectives: (1) to determine how well the agricultural community's delivery system will work in water quality management, (2) to see if farmers will accept a program for establishing best management practices (BMPs), and (3) to monitor the BMPs and water quality to provide information on the best methods for agricultural nonpoint source control and prevention.

The seven projects selected represent various types of farming and are located in New York, South Carolina, Indiana, Oklahoma, Nebraska, South Dakota and Washington. Each area has an agricultural nonpoint source pollution problem which adversely affects water quality in downstream lakes and streams. This program is described in some detail below:

Indiana: The project is located in the Indiana Heartland Region, which includes the Eagle Creek and Stotts Creek watersheds. About 80 percent of the area is cropland. The project involves land treatment to protect a 1,400 acre reservoir within the Nation's largest city park. The 146,000 acre area covers part of six

TABLE XI

AWT PROJECTS BEING EVALUATED IN 208

EPA Region	State	Project Area
I	Vermont	o Lower Winooski River (Burlington, Montpelier)
II	New York	o Seneca, Oswego, Oneida River System o Upper Hudson (Glen Falls)
III	Delaware	o Kent County o LeCato Plant (Lewes, Rehoboth Beach)
	Maryland	o Patuxent River
V	Indiana	o Little Calumet River (Portage, Valparaiso)
	Wisconsin	o Rock and Upper Wisconsin Rivers
	Ohio	o Major effort ($450,000) to re-evaluate WLA's for much of State
VI	Texas	o Major effort (over $1 million) to develop WLA's in several areas of State
IX	Nevada	o Las Vegas/Clark Co.

counties. Measures used include: establishing vegetative cover, cover crops, terraces, critical area seeding, ponds, sediment and chemical retention, sod waterways, diversions, and windbreak restoration.

Nebraska: In the Maple Creek Watershed in northeast Nebraska, an area with about 230 miles of streams, farmers crop intensively on uplands sloping loose soils. High intensity, short duration storms wash soil from this cropland, producing water quality problems downstream. The watershed has 33,000 acres in three counties. Measures used include: terraces, diversions, conservation tillage ponds, sod waterways, windbreaks, erosion control structures, animal waste control, and seedings.

Oklahoma: Sediment is the problem for this MIP area in the Little Washita Watershed. This is an experimental watershed of USDA's Science and Education Administration (SEA), which monitors water quality. Measures used: seedings, terrace, diversions, grazing land protection, windbreak restoration, sediment retention, erosion, sod waterways, and ponds.

South Carolina: Anderson County's Broadway Lake, located in a 24,196 acre MIP area, is plagued by erosion, sedimentation, agricultural chemicals, and animal wastes. All 302 acres of lake show sediment damage. Local groups strongly support the project aims of improving the lake for fishing, swimming and boating. Measures used: seedings, terraces, diversions, conservation tillage, critical area seeding, ponds, erosion control structures, and sod waterways.

South Dakota: Water quality problems in this MIP area are from feedlot runoff and sediment from cropland. The project provides land treatment in the 45,000 acre watershed draining into Lake Herman in Lake County. The Lake Preservation Committee of South Dakota ranks Lake Herman among the 40 most in need of treatment. Measures used: seedings, terraces, grazing land protection, windbreak restoration, conservation tillage, permanent wildlife habitat, seedings, and crop rotations.

Washington: Farmers in the Sulphur Creek Watershed in Yakima County, this 63,835 acre MIP area, use irrigation in growing a variety of fruit, vineyard, vegetable, and grain products. This farming technique creates erosion problems on the sandy loam soils and rolling terrain. Measures used: irrigation water conservation, erosion control structures, sod waterways, seedings, and water management systems.

New York: In the West Branch of the Delaware River, this MIP area is marked by a concentration of dairy farms and large acreages of sloping cropland and forest land with erosion problems, causing water quality difficulties in a municipal reservoir--a condition the project hopes to correct by applying animal waste management and erosion control practices such as seedings, stripcropping, diversions, erosion control structures, timber stand improvement, tree planting, and cover crops. The area covers 287,000 acres in Delaware County.

The New York project is located immediately above the Cannonsville Reservoir, one of the major dams supplying water to New York City. The Cannonsville Reservoir contains 98 billion gallons of water and is the third largest reservoir in the City system. The 4800 acre lake has a safe yield of 310 million gallons daily (MGD) of which 200 MGD is used on an average day, 15 percent of the City's needs. Although the reservoir has been in use only since 1964 its water quality is deteriorating. As a result the City does not use all of the water it could from Cannonsville with only 8 percent of the water released from the dam going to the City with the remainder used to maintain flows in the Delaware River.

The water supply has taste and odor problems caused by severe algal blooms in the summer and early fall. The algale blooms result from the high level of nutrients entering the stream with phosphorus presumed to be the major cause. Since the City will require additional water in the near future and Long Island may tie into the City supply, cleaning up the water would result in significant savings from not having to build additional storage.

The 450 square mile watershed is predominantly dairy farms, with about 25 percent in cropland and pasture and 70 percent in woodland. BMP installation started in the spring of 1978. It is progressing very well. One of the objectives of the program was to determine how well farmers would cooperate. Participation has been excellent with most of those contacted to date agreeing to cooperate. The work is being concentrated on certain critical watershed areas. In the first area 37 of the 43 farmers in the watershed indicated willingness to cooperate. Of those 37, three had no problems and the remaining 34 are installing the needed BMPs. The people working at the local level believe this level of cooperation can be attained throughout the entire county if they had the resources to work with all of the farmers.

Most of the BMPs required are animal waste facilities such as barnyard controls, manure storage and better feedlot operations. The average per farm cost of the facilities has been $3,500. While not excessively high, it can be seen that capital investment requirements are significant.

Since this watershed is typical of much of the northeastern dairy country, EPA will monitor and evaluate the BMPs being installed and determine their effects on water quality. This work will be done in conjunction with New York State and Cornell University. New York City has a number of monitoring stations in the watershed and our work will tie into the monitoring being done by the City. One of the reasons more data does not exist for identifying the causes of agricultural nonpoint source pollution is because intensive monitoring of this type is expensive. We will spend about one million dollars on the New York project in the next 3 to 5 years for data collection and analysis. In addition, USDA will spend a similar amount of funds to provide both technical and financial assistance to the farmers in establishing BMPs.

A major feature of the MIP projects is the use of presently available resources to implement the program. In the New York project both USDA (through the Agricultural Stabilization and Conservation Service and Soil Conservation Service) and EPA are providing substantial support. This activity can be carried out in only a few projects. Additional technical and financial assistance will be required if significant progress is to be made.

Another MIP is the Broadway Lake project located near Anderson, South Carolina. It provides an example of the typical water quality problems which are associated with farming in the Piedmont area of the southeastern United States. This 25,200 acre area has 6,500 acres in cropland, 8,200 in hay and pasture, 7,000 acres in woodland and the remaining 3,500 acres in residential and recreational uses.

The one crop pattern of farming, continuous soybeans, results in large amounts of erosion and sediment. Although many of the slopes are only 3 to 4 percent, the fields wash badly with erosion rates of 10 or more tons per acre common. The sediment is very evident on the roads, in ditches and streams, and in Lake Broadway.

Lake Broadway is a 300 acre lake formed by a 40-year-old dam. The Lake provides extensive recreational opportunities such as fishing, swimming and boating for the people in the area. It is owned by Anderson County, which maintains recreation facilities at a number of locations around the Lake. The area surrounding the Lake has been developed with more than 500 homes. Deteriorating water quality is affecting the use of the Lake by the general public and surrounding homeowners.

There are about 400 farmers in the watershed, many of them part-time, working relatively small farms with a single cash crop soybeans. This is a typical situation in many areas of the southeast. The average yield of 25 bushels of soybeans per acre at the present price of $8.00 per bushel brings a gross return of about $200/acre to the farmer. Farm income is not very high.

The project, initiated in 1978, has made a lot of progress in 2 years. Of the 400 farmers in the watershed 85 had been cooperating with their local Conservation District when the project started. Within one year more than 90 additional farmers have begun to install BMPs.

The local people working on the project have indicated they believe 80 to 90 percent of the farmers will cooperate in establishing required BMPs, but it will take about six years to get all of the work done.

The BMPs being used are terraces, grass waterways and sediment dams on the cropland and seeding and renovation of the hay and pasture areas. In 1978, 7.5 miles of terraces were established while 15.5 miles were constructed in the spring of 1979 with more scheduled this fall. BMPs are being established in the watershed at a rate of three times that being done in the remainder of Anderson County. People working on the project indicated the program could be duplicated in surrounding areas if additional technical and financial resources were made available.

This project, along with all of the MIPs, has had good cooperation among local, State and Federal agencies. Not only did the environmental and agricultural agencies work together, but others such as highway and forestry agencies have assisted in establishing BMPs. An estimated 2-3 years of volunteer assistance is being provided by the local people in managing the project.

The entire project will cost about $750,000 in Federal funds, of which about half is being provided by USDA and the remainder by EPA. The USDA funds are for technical assistance by the Soil Conservation Service and Forest Service and cost sharing of BMPs by the Agricultural Stabilization and Conservation Service. EPA funds are being used to help construct sediment basins on critical watersheds and for monitoring and evaluation of the stream quality to determine the effectiveness of BMPs. EPA has combined three programs--section 208 water quality management, Clean Lakes, and research--to assist this project.

As with the other MIP projects, one of the primary objectives is to obtain more information on nonpoint source problems and the effectiveness of BMPs. EPA has provided $190,000 to Clemson University to conduct a water quality monitoring program in the watershed. The monitoring program was set up in 1978 and extensive sampling has already been completed. The sampling program is concentrating on storm events since this is when runoff occurs and most of the sediments and nutrients enter the streams and Lake. The Clemson group is working on six small drainage basins within the watershed. It is measuring physical, chemical, and biological parameters on areas where BMPs are being established on three similar watersheds where no work will be done during the project in order to compare the water quality results. The information gained from this project will be used to determine BMP effectiveness and water quality benefits in similar southeastern farming areas.

The success of the MIP projects encouraged EPA and USDA to expand their cooperative authorities. In 1979 the Agricultural Stabilization and Conservation Service, USDA, and EPA selected 21 special water quality projects for BMP implementation. These projects are listed in Table XII.

The benefits to be achieved through a control program on the farms and ranches of the country will be widespread, and may include better crop yields for some areas. Many benefits will be downstream and not on the farms or ranches where the BMPs are established. In many cases, the costs of the BMPs for an individual farmer will be greater than the benefits which he receives. Hence the need for some financial incentives. EPA strongly supported the Clean Water Act Amendments of 1977, which recognized the need for assisting farmers in establishing BMPs and authorized a cost-sharing program for that purpose. The Administration requested an appropriation of $75 million to USDA to initiate the program in FY 80. Implementing the Rural Clean Water Program, as this part of section 208 has been named, will enable EPA and USDA to reduce agricultural NPS pollution in many of the most critical problem agricultural watersheds in the Nation.

EPA's Agriculture strategy is to develop the cause/effect relationship data by evaluating selected MIP and ACP projects and other special projects such as the Wellton-Mohawk irrigation districts. Additional funds will be sought from other sources such as ORD, ACP and Small Farmer Demonstration projects. Continual technical assistance will be pursued from the Extension Service and SCS.

Steering Committees are being established in each State to administer the RCWP and several applications have been prepared. The Committees will continue to work toward putting as many implementation monies (such as ACP funds) as possible to the identified priority areas.

TABLE XII: AGRICULTURAL CONSERVATION PROGRAM (ACP) PROJECT SUMMARY

STATE	LOCATION	NO. FARMS	TOTAL COSTS COST	TOTAL COSTS COST-SHARES	1979 FUNDS COST	1979 FUNDS COST-SHARE	LENGTH OF PERIOD
Illinois	Pike County Blue Creek	59	$1,400,000	$400,000	$470,000	$200,000	3 years
Tennessee	Gibson-County North Fork Forked Deer River	570	3,425,000	2,740,000	500,000	400,000	3 years
Nebraska	Hall County Buffalo Bottom	325	979,000	780,497	325,000	250,000	3 years
Alabama	Limestone County Swan Creek	675	1,313,335	738,750	325,000	250,000	3 years
Kansas	Jackson-Nemaha Counties Soldier Creek	410	1,801,952	1,621,758	325,000	250,000	5 years
Connecticut	Windham County	35	274,000	201,685	87,500	70,000	3 years
Oregon	Wasco County Center Ridge	21	500,000	375,000	166,500	125,000	3 - 5 years
Arkansas	Searcy County Chief Wiley's Area	150	775,000	620,000	162,500	130,000	3 years
Puerto Rico	Caguas Dirstrict Gurabo and Valenciana River Basins	998	720,000	575,000	87,500	70,000	3 years
Kentucky	Fulton County Mud, Rush and Little Bayou de Chien	250	2,500,000	2,022,425	440,000	350,000	3 - 5 years

TABLE XII, cont.

			TOTAL COSTS		1979 FUNDS		
STATE	LOCATION	NO. FARMS	COST	COST-SHARES	COST	COST-SHARE	LENGTH OF PERIOD
Michigan	Huron and Tuscala Counties Southeast Saginaw Bay	1851	$5,519,645	$4,729,502	$500,000	$400,000	3 years
Ohio	Seneca, Crawford, Huron Honey Creek	710	349,705	192,214	115,000	65,000	3 years
Mississippi	Marshall and Benton Eroding Wolf	229	1.193,060	1,073,754	375,000	300,000	3 years
New Hampshire	Cheshire County Great Haughton Brook	10	80,000	64,000	31,250	25,000	3 years
Missouri	Monroe County Middle Fork of Salt River	185	1,878,750	1,503,000	440,000	350,000	3 years
Indiana	Allen County Dirty Bakers Dozen	200	616,000	462,000	100,000	75,000	3 - 5 years
Maine	Aroostock County	630	5,000,000	4,000,000	500,000	300,000	10 years
South Carolina	Greenville-Spartanburg Tyger Rivers	1100	800,000	582,000	250,000	200,000	3 years
Texas	Hopkins, Wood, Hunt, Rain Lake Fork Creek	193	660,000	525,000	190,000	150,000	3 years
Maryland	Cecil County Northeast	60	200,000	150,000	125,000	100,000	3 years
New Mexico	Lincoln-Otero Counties	140	1,210,000	968,000	345,000	275,000	3 - 5 years
	TOTAL	8801	$31,195,447	$24,334,585	$5,860,250	$4,335,000	

D. Urban Runoff

Many 208 studies began with the assumption that urban runoff was an important cause of water quality problems. Although the studies have progressed and much information on runoff and receiving waters has been developed, it is still difficult to assess comprehensively urban runoff's role as a major cause of problems. That is partly because of interferences by other sources and complex relationships within the receiving waters. But it is also because of difficulties in deciding what constitutes a "problem." In some cases, "problems" are synonymous with standards violations; in others, "problems" are synonymous with an impairment or denial of beneficial uses.

The practical implication of these differences of opinion is that local agencies are reluctant to make commitments to implementing controls, in the absence of clear problem definition.

Another major obstacle to implementation is associated with the uncertainty surrounding the effectiveness of controls. Many of the measures proposed for controlling urban runoff are either new or special applications of conventional practices used for other purposes. Engineers, planners, public works personnel, and other decision makers are understandably reluctant to invest large amounts of time and money in controls which may not perform as hoped.

Congress, in its Clean Water Act Amendments, did not provide implementation funds for urban runoff, because it felt that the current state of technical knowledge was insufficient to justify large-scale action.

We have initiated the Nationwide Urban Runoff Program (NURP) to provide some of the required answers. The objectives of NURP are twofold. First, the objective at the local level is to establish the link between planning and implementation. To establish that link will require answering the questions posed earlier: what are the problems, the pollutants causing the problems, the pollutants' sources, the controls for those sources, and the cost and effectiveness of the controls in meeting water quality goals?

The second objective is to conduct an assessment of urban runoff (not including combined sewers) on a nationwide scale and present the findings in a report to Congress in 1983. The report will describe:

- The nature of urban runoff problems where significant problems have been identified.
- The causes of these problems (e.g., source, transport modes, impact mechanisms).
- The severity of these problems, based on consideration of beneficial uses and water quality standards.
- Opportunities for controlling urban runoff problems, including descriptions of control measures, their effectiveness, costs, and strategies for broad-scale implementation.

Ancillary program objectives will be:

- To develop the information base required to assess urban runoff problems, including the occurrence of heavy metals and other toxics in urban areas.
- To examine the adequacy of current dry-weather water quality standards when used to judge the significance of storm-dominated pollution problems.
- To develop the information base required to identify, assess, and implement effective controls.

The Nationwide Urban Runoff Program involves selecting a limited number of locations for intensive data gathering and study with the purpose of:

- Developing implementation plans for those areas.
- Demonstrating transferability, so that solutions and knowledge gained can be applied in other areas (without the need for intensive data gathering efforts).

Thirty such studies will be conducted nationwide, with some pairing in order to demonstrate transferability. This number of studies is needed in order to cover a wide range of climatic regimes. The first projects selected are those with obvious problems (e.g., beach closures, impacted water supplies, impacts on aquatic life). A list of projects currently funded appears below.

The strategy calls for providing a full range of technical and management assistance to each project and for communication of experiences, sharing of data, and transfer of lessons learned on a timely basis. The strategy recognizes the need for program coordination, both within and outside of the Agency, to maximize the use of limited resources and minimize conflict and overlap. As the program gains momentum and information is generated, mechanisms will be implemented to insure that the information gained is communicated to local governmental officials. An important activity will be to involve the public so they become acquainted with the program and its benefits and costs, and so they can provide inputs to decisions at the local level.

Projects Underway In National Urban Runoff Program (Funded Before FY 1979)

Myrtle Beach, South Carolina: Maine problem identified is bacteria entering the storm drainage system. Project is to determine magnitude of problem and identify control methods.

Illinois: A project will be carried out in Champaign-Urbana, Illinois, to test the effectiveness of a street sweeping program.

Southeast Michigan COG: The objective of the program is to test the effectiveness of detention basin storage. The project is in the Clinton River Basin in Oakland County, Michigan.

Tri-County RPC (Lansing, Michigan): The objective of the study is to gather information on detention basins and correlate it with land use and related pollutant generation.

Bellevue, Washington: In this joint project in cooperation with ORD and USGS, several management practices will be evaluated including street sweeping, catch basin cleaning, and sewer flushing.

Seattle METRO: This study is to identify the importance and effect of priority pollutants in receiving waters. Twenty priority pollutants will be evaluated.

Castro Valley, California: The project will determine street surface contaminant loadings and accumulation rates and the effectiveness of erosion control techniques and street sweeping.

Ann Arbor, Michigan: The objective of this project is to determine cause and effect relationships for stormwater runoff pollution and evaluate effectiveness of retention areas and detention basins.

Projects Funded in FY 1979

Southeast Wisconsin RPC: This project, in conjunction with the Wisconsin DNR, will evaluate street sweeping timing and frequency effectiveness. Stormwater detention will also be evaluated (USGS).

Denver Regional COG: The specific objectives are to characterize runoff pollutant loadings by land use type and determine the effects of nonpoint source pollution loads on receiving waters (USGS).

Austin, Texas: The program will focus upon evaluating the effectiveness of preventative measures for stormwater control that can be applied to new developments in order to preserve Lake Austin from degradation.

Long Island, New York: The study is to determine the source, type, quantity and fate of pollutants in runoff and evaluate changes in runoff quality in response to selected management practices.

Mystic River, Massachusetts: The aim of the project is an overall assessment of the urban runoff problem in the watershed with particular emphasis on the effects of direct stormwater discharges into the Upper or Lower Mystic Lakes.

Lake Quinsigamond, Massachusetts: This project will build upon a Clean Lakes Program intensive survey to provide the necessary information about urban runoff, resulting in control recommendations.

Durham, New Hampshire: The project will measure mass loading of urban runoff constituents during individual storm events and evaluate maintenance practices. Practices to be evaluated may include litter control, chemical use control, street sweeping and detention basins.

Northeastern Illinois Planning Commission (Chicago Metro Area): The major objectives of this project are to evaluate source controls and determine the effectiveness of stormwater detention.

Lane, Oregon COG: The project will focus on special concerns such as toxics and air quality/runoff interaction, pilot studies for management practice definition, and promotion of public awareness and action.

Los Angeles, California: The purpose of the urban runoff study in Upper Newport Bay is to identify sources of urban runoff pollution entering the Bay and evaluate a variety of best management practices. These practices include street and sidewalk sweeping, catch basin cleaning and using sumps to collect runoff from service stations.

Winston-Salem, North Carolina: This project will focus on pollutant source evaluations and management practice evaluation. Biological sampling will be carried out in streams draining the managed watersheds.

Washington (D.C.) COG: The basic objective is to develop planning tools to estimate nonpoint source loads.

Potential Projects

Tampa, Florida: Specific objectives of the proposed project are to assess the water quality of the receiving water, determine amounts and impacts of pollutants on receiving water and review and evaluate a variety of strategies.

Little Rock, Arkansas: The proposed project is to analyze current and proposed BMP's to control urban runoff and determine which are effective.

Lake George, New York: The purpose of the proposed study is to determine the nature and magnitude of the urban runoff problem so that appropriate control strategies can be developed.

Irondequot Bay, New York: The objective of the program is to establish the significance of urban runoff as a contributor to eutrophication and put urban runoff into perspective with point sources.

Baltimore RPC: The major objective of the project is to define the pollutant contributions from the Jones Falls watershed to Baltimore Harbor and the impact of pollutant loads on the Harbor's designated beneficial uses.

St. Louis, Missouri: The project is to evaluate the water quality effectiveness of the St. Louis County stormwater control program. BMP's to be implemented will be chosen from the list prepared in the 208 study (USGS).

Salt Lake County, Utah: The principal objective is to characterize the hydrology of urban runoff and demonstrate the effectiveness of alternative strategies in reducing measured impacts. Management approaches to be evaluated may include detention basins, street sweeping, erosion control and public education (USGS).

In some cities, implementation of urban runoff BMP's based on the findings of 208 plans is proceeding even though the data gaps listed above exist. Some examples are:

Georgia: Strategies for NPS controls developed by the city of Macon include retention basins, street sweeping and stormwater and solid waste facilities inventory and maintenance.

Tennessee: Nashville/Davidson County passed a stormwater management ordinance.

Florida: Tallahassee has implemented a street sweeping program costing $150,000 with an annual budget of $60,000. Also, a large detention basin is under construction to remove 67 percent of the annual runoff into Lake Jackson. Volusia adopted a stormwater management ordinance to control stormwater from future developments.

Washington: Snohomish County is initiating adoption of storm drainage/erosion control ordinances, and initiating an inspector training program to achieve implementation and upgrading of surface drainage control ordinances. Clark County is purchasing property for retention basins and will implement BMP's as recommended in the 208 plan. Metro Seattle is adopting ordinances leading to the establishment of stormwater drainage districts. A salmon enhancement program has been started as part of a broad water quality project to rehabilitate urban streams.

E. Silviculture

EPA's overall strategy for controlling silviculture nonpoint source pollution is to (1) implement the recent (February, 1979) agreement with the Forest Service, which provides the mechanism for the two agencies to work together to achieve common goals, (2) implement BMP's contained in certified and approved WQM plans, using available assistance programs, and (3) continue to develop the technical and institutional bases for controls through prototype projects. EPA's role will be largely one of providing expert technical and financial management assistance for agencies addressing silviculture NPS problems.

Many of the silvicultural activities within the 208 program have been accomplished in close coordination with the Forest Service. The Forest Service/ EPA Agreement uses existing programs and institutional arrangements to strengthen forestry WQM planning and implementation projects. New forestry programs are not required, simply a re-emphasis to highlight the WQM aspects of existing programs. Forest Service personnel are located in EPA Headquarters, Region VIII, and Region X to coordinate FS/EPA activities such as the following examples:

- EPA through an Interagency Agreement with Forest Service is supporting a national training package for loggers and operators. This will increase the knowledge and understanding of individuals involved in planning and implementing forestry BMP's. The package will include a national inventory of existing forestry WQM training materials and develop new materials to fill voids.

- FS/EPA and State cooperators will implement a National Forest land management planning project to strengthen communication links among the agencies and better define each agency's role in relation to the National Forest Management Act regulations.

- FS/EPA jointly developed two basic planning documents for section 208. The Water Resources Evaluation Nonpoint Source (WRENS) Report provides the state-of-the-art hydrologic knowledge for WQM planning. The report is being printed and will be distributed to State and local WQM agencies.

- The Streamside Management Zone (SMZ) Report describes existing laws and ordinances for protecting sensitive water zones. New Mexico is using examples in the report to draft legislation to protect SMZ's.

- WQM aspects of forestry practices are being highlighted in the Upper Rio Hondo special water quality project in New Mexico. Special forestry emphasis is placed on streambank protection and road stabilization. A similar project is anticipated in the North Fork of the Forked Deer.

- State projects to strenghten relationships between State WQM plans and State forest resource programs are being initiated in Washington, Colorado, and Indiana. These projects will further identify commitment of resources and personnel to implement silvicultural elements of State WQM plans.

- An EPA/FS/State cooperative effort produced a booklet titled "Forests Protect Water Quality." This booklet is part of an informational and educational effort to make landowners aware of forestry BMP's. The publication was prepared in cooperation with 13 southern States, Puerto Rico, and the Virgin Islands.

As a result of initial 208 planning, silvicultural BMP's are being established in most States where silvicultural NPS problems were identified. These include:

Florida: A WQM project in Blackwater State Forest is being initiated to evaluate the effects of forestry BMP's on water quality. EPA is providing $25,000 through the State WQM agency to evaluate the forestry practices applied in a 300-foot wide zone along streams.

Georgia: The Georgia Forestry Commission is implementing a project near Gainsville, Georgia to demonstrate how WQM practices are integrated into improved forest harvesting techniques. These practices are also being applied in streamside management zones. This project is funded by USDA, Forest Service.

South Carolina: The State Forester assigned a full-time forester to initiate BMP implementation in the Broadway Lake Model Implementation Project (MIP). Through his actions, 39 landowner contacts were made. This has produced 10 land management plans for 850 acres. Forty miles of firebreaks were installed and nearly 1,200 acres were prepared and planted under cooperative forestry programs.

New York: Through State forestry efforts in the West Branch of the Delaware River Model Implementation Program (MIP), technical assistance is being provided to landowners and loggers for log road and landing design, road stabilization and road maintenance. Forest land management plans and harvesting guidelines are being proposed on the Cannonville Reservoir. BMP demonstration and evaluation areas are being developed on the watershed area.

Oregon: Oregon passed a State Forest Practices Act in 1972 which was the first of its kind in the U.S. to set forth procedures and methods to control nonpoint source pollution from forestry lands. This law establishes a firm instrument for implementing the approved silvicultural 208 program. The Governor has designated the Oregon State Forestry Department as the management agency for the program and designated the USDA Forest Service and USDI Bureau of Land Management as the implementing agencies for NPS pollution control on Federal lands under their jurisdiction.

As a result of 208 planning, the Board of Forestry amended over 50 of their existing rules to better reflect water quality considerations and revised their public participation procedures to obtain better public input.

Wyoming: Teton County is implementing ordinances and performance standards developed in the WQM plan. Teton National Forest has adopted and is implementing BMP's under the authorization of the Forest Supervisor. The success of this effort is the result of the intergovernmental coordination developed during the planning process.

Vermont: The Timber Truckers and Producers Association (VTTPA) volunteered to assist the State in reducing erosion from logging. When complaints are received, a committee from the Association makes an on-site visit with the logger to attempt to resolve the problem through persuasion. If this fails, State enforcement officials are called in to take appropriate action.

F. Ground Water Contamination

Although large-scale ground water contamination is not documented, localized contamination problems are becoming more common, and are often associated with nonpoint sources of pollution, such as leachate from landfills and septic tanks, saltwater intrusion, and seepage from agriculture. Several of the WQM agencies have been analyzing ground water problems. Ventura, California, has recommended a program to control salt-water intrusion; Middlesex County, New Jersey, closed an open dump that was impacting ground water; New Castle County, Delaware, initiated a retreival well system to stop a leachate plume from contaminating a major water supply; Spokane, Washington, is preparing a plan to prohibit the contamination of its aquifer from septic systems. In their continuing programs, Kansas and Connecticut are preparing legislation for ground water controls.

Although there are many current projects on ground water protection, the problems and issues are many, and knowledge and data are limited. The impact of ground water quality on surface water is little understood. We are just beginning to think about ground water pollution.

As with nonpoint sources in general, the WQM program is the only Federal program taking a systematic approach to the protection of ground water quality. The Drinking Water program is responsible for the Underground Injection Control regulatory program, a survey of pits, ponds, and lagoons, and the designation of sole source aquifers. (The sole source designation requires an EIS for all Federal projects but does not have authority to control other pollution problems.) The Solid Waste program is responsible for regulating landfills and the disposal of hazardous wastes and for a survey of open dumps. The WQM program has the capability to consider the entire ground water problem in an area, using data from other programs, to develop and coordinate controls from various authorities.

EPA is currently developing a detailed ground water strategy and examining the ground water issues. This is being undertaken jointly among the Offices of Water Planning and Standards, Drinking Water, Solid Waste, Water Program Operations, and Research and Development.

Through FY 1980, the WQM program will spend between $10 and $20 million on the development and implementation of ground water quality protection projects. Water Planning Division has retained several ground water experts to assist State and areawide agencies with work plan development, analyses, and evaluations. Several (8 to 10) prototype projects are in the selection process. They will cover a cross-section of issues. Technical assistance will be provided during the project. Information acquired from these projects will be utilized by EPA for program direction, needs assessment, and formation of ground water policies.

G. Other Nonpoint Sources

In the other nonpoint source problem areas--construction runoff, mining runoff, and other less-common problems--EPA will continue to both implement BMP's identified in certified and approved 208 plans and develop technological and institutional bases for control.

In the construction runoff area, WQM program efforts in FY 1980 and beyond will focus on States developing regulatory programs since BMP's are readily available. The overall objective for construction runoff is for all States with problems of this type to have regulatory programs in place by FY 1983. Many States already have adequate controls.

With respect to mining runoff, EPA is working closely with, the Office of Surface Mining (Department of the Interior) in implementing the Surface Mine Reclamation Act. The authorities and resources available to OSM under their Act are substantially greater than those available under section 208.

A new 208 activity which a number of States will address as a result of the CWA amendments is the 208 dredge and fill program. In the 1977 amendments, Congress provided for a State section 404 dredge and fill program to replace the Corps of Engineers program where States desire the responsibility. In addition, States delegated the 404 permit program can also develop a regulatory dredge and fill program under section 208 which would not require permits. This program would replace certain parts of a State's 404 permit program and eliminate paperwork on small dredge and fill projects with minimal environmental impacts.

EPA recently published draft 404 regulations and is in the process of developing 208 dredge and fill regulations which it will issue this fall. We expect a number of States to develop dredge and fill programs in the 208 continuing planning process in FY 1980.

For these problem areas (construction, mining, dredge/fill, and others) implementation has been relatively slow to occur. One reason is that the legislative process, including the need for broad public support, takes time. However, there are some examples of State and local implementation actions resulting from 208 planning. They include:

North Carolina: North Carolina's mining act was recently amended to include civil in addition to criminal penalties for mining without a permit. This move was made in response to a Statewide 208 WQM plan recommendation. Criminal penalties in the old mining act worked against effective enforcement because they were regarded as being too drastic to be used to deal with routine violations of the act.

Colorado: State mining regulations were revised to strengthen water pollution control provisions dealing with mining tailings disposal.

Virginia: The Lenowisco Planning District Commission is a designated areawide planning agency in southwest Virginia's coal mining district. LPDC examined abandoned coal mine pollution problems and established priorities for pollution abatement work as a part of its local 208 planning effort. This information from the local 208 plan is being used by the State of Virginia as the basis for the State's Abandoned Mine Reclamation Plan under the Department of the Interior's Abandoned Mine Reclamation Program created by the 1977 Coal Surface Mining Act.

California: The State of California has developed abandoned mine pollution abatement project specifications for sulfur, copper, and other metallic mines as a part of that State's continuing 208 WQM program work plan. Previous studies have shown 200 miles of California streams to be completely sterile or to have seriously limited aquatic diversity as a result of mine drainage.

North Carolina: The State passed a tough erosion and sediment control law in 1973. For any project (public or private) in the State involving the disturbance of an acre or more of land, a developer must first prepare an acceptable erosion and sediment control plan.

The State law allows cities and counties to develop their own erosion control programs. Presently, 19 municipalities and 16 counties in North Carolina have such programs. In those jurisdictions, the State does not review a developer's erosion control plans--unless the project is financed with State or Federal funds. In jurisdictions having no erosion and control programs, the State reviews such plans for all projects, public or private. The State's erosion control program is performance-oriented. It is flexible, encourages a developer to use his imagination to install any erosion control measures he see fit--so long as they do the job.

In effect since 1974, the North Carolina erosion control program is considered to be fairly successful, substantially decreasing sediment pollution.

Lewis and Clark County, Montana: A sediment control ordinance was approved by local referendum, as a result of technical assistance and public participation provided under 208 planning.

In response to the 1972 Federal Water Pollution Control Act Amendments, the Montana legislature requested the State Department of Natural Resources to head up a study of sediment control problems and legislative issues. The study yielded three major findings: (1) erosion is a serious water pollution problem in Montana; (2) existing enabling legislation provides sufficient authority to address erosion; and (3) any sediment control program should be locally administered and enforced.

The Montana Conservation District law permits local conservation districts to develop soil conservation ordinances, which must be adopted by local referendum. The ordinances are administered and enforced locally. This enabling legislation had never been carried out, until EPA funded a pilot program to promote the enactment of a sediment control ordinance in Lewis and Clark County.

Lewis and Clark County was selected for this pilot program because it was willing to participate and its land use patterns and erosion problems typify Montana conditions.

On June 20, 1977, voters of Lewis and Clark County approved the enactment of a sediment control ordinance. This ordinance incorporates land management standards (best management practices) developed by: the Soil Conservation Service for agriculture; the Montana State Forestry Committee for silviculture; and the Lewis and Clark County Conservation District for subdivision construction. These best management practices (BMP's) are based on site-specific soil, climate, and use characteristics.

Implementation of a Conservation District-approved erosion and sediment control plan is the primary means of complying with these standards or practices. Erosion and sediment control plans are optional for agricultural activities, as long as standards are met or exceeded and no erosion problems occur; they are mandatory for most construction/subdivision activities. In addition, forestry operators must either prepare an erosion and sediment control plan or give the Conservation District notice before starting forestry activities.

Any land occupier, District Supervisor, or State or county water quality official may file a complaint alleging that accelerated erosion or sediment damage has taken place. If a violation of the ordinance is verified by the Conservation District, the land occupier is given an opportunity for voluntary compliance. If the violation is not corrected, the District Supervisors are authorized to issue stop work orders and impose fines up to $500 a day.

VII. EPA'S MANAGEMENT STRATEGY

In conjunction with the program strategy above, EPA will implement a management strategy for the long run, geared toward achieving the Clean Water goals of the Act for nonpoint sources in a cost-effective, efficient manner. In FY 1980, and beyond, EPA will initiate a more active management stance for the WQM program, including:

- Initiation of a long-term Financial Management Assistance Project (FMAP) to help State, areawide, and local agencies develop financial expertise for water quality management planning and implementation.
- Assessment of five-year costs of planning and administering solutions to point and nonpoint source water quality problems for budget justifications and analysis of priorities.
- Implementation of revised and consolidated regulations for the program (40 CFR, Part 35, Subpart G, May 1979). Requirements for activities under sections 208, 303(e), and 106 were combined into a single management programs. The regulations represent a significant simplification of the process. In addition, the regulations require that an agency be implementing a portion of its plan by FY 1980 in order to have continuing funding. The roles of State and areawide agencies have also been more clearly defined in an attempt to minimize jurisdictional issues.
- Participation by EPA Regions, State and areawide staffs, and the public in annual State/EPA Agreements which coordinate and integrate programs, identify high-priority problems, lay out approaches to solving these problems, and assign responsibility.
- Use of WQM public participation mechanisms to support not only planning activities but also State/EPA Agreement development, WQM plan implementation, and refinement of WQM plans through site-specific projects.
- Emphasis on better Regional Office and Headquarters management of the WQM program through training for project officers, development of management strategies, and annual management reviews; EPA will use contract funds to expand management capability at all levels of the program.

The WQM program has made great progress in cleaning the Nation's waters. The program has brought about documented water quality improvements and cost-savings, and will bring more as additional WQM plans enter the implementation stage.

Since FY 1974, State and areawide 208 agencies have--with 208 grants--identified their water quality problems, developed solutions for the less complex problems, and identified responsible units of government to implement the solutions. In FY 1980-1983, these agencies will fill in gaps in their WQM plans, largely through the use of prototype problem-solving projects for more difficult problems. EPA will provide funding, expert technical assistance, and information transfer to ensure the success of their efforts and the transferability of their results.

Thus, by FY 1984, EPA and the WQM agencies will have gained much knowledge of both problem-solving techniques and future program needs. Based on this information, EPA will recommend future directions for the WQM programs, roles for the various levels of government involved, and necessary changes for the existing program.

VIII. CONCLUSION

Today's 208 Water Quality Planning and Management Program is far removed from initial days of confusion and delay. This program has a definite problem-solving orientation. It directs itself toward those pervasive nonpoint sources of pollution which, without controls, will prevent us from achieving the goals and requirements of the Clean Water Act. It can contribute much to our knowledge of control technologies and to achieving the goals of the Clean Water Act at the least possible cost to the taxpayer. EPA has developed a realistic, implementable five-year strategy for nonpoint controls which must accompany our point source achievements if we really seek to make the waters of our Nation fit for swimming, fishing, recreation, irrigation, and drinking. To carry out that strategy, EPA will need continued authorization of the Water Quality Management program past FY 1980. Just as importantly, we will need the support and endorsement of the Congress, in its oversight role, for the course we have mapped out.