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HISTORY OF FEDERAL WATER RESOURCES PROGRAMS AND POLICIES, 1961-70

Beatrice Hort Holmes

U.S. Department of Agriculture
Economics, Statistics, and Cooperatives Service
Miscellaneous Publication No. 1379

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HISTORY OF FEDERAL WATER RESOURCES PROGRAMS AND POLICIES, 1961-70. Beatrice Hort Holmes, Natural Resource Economics Division, Economics, Statistics, and Cooperatives Service, U.S. Department of Agriculture, Miscellaneous Publication No. 1379.

ABSTRACT

This publication is a comprehensive account of major Federal programs and policies relating to conservation and development of water and related land resources and to water pollution control in the years 1961 to 1970. It discusses most relevant Federal legislation and the functioning of Federal and federally-assisted programs involving research, planning, construction, and regulation.

Also discussed are national, regional, and local political issues related to water programs and policies; presidential, congressional, and agency policymaking processes; and origins of the environmental movement and its effects on water resources programs and policies.

Keywords: Water resources development, water pollution control, water resources planning, water legislation, environmental legislation, Federal agencies, environmental movement, and water politics.

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PREFACE

This is the author's second history of the Federal Government's involvement in water resources development and regulation. The first covered 160 years (*I*).¹ It extended from the first glimmerings of Federal interest in navigation to the huge omnibus rivers and harbors and flood control acts of the 1950's.

This report covers only 10 years. But it is more than twice the length of the first volume because these 10 years called for a more detailed examination.

These were the years in which water pollution control became the most important Federal water resources program. Provision of domestic water and sewer systems also became an important Federal program. These were the years in which technological research and development in desalting water and treating wastewater became important Federal programs. Plans were readied to make weather modification the third great Federal water research and development program. They were also the years that saw the revival of something resembling the New Deal concept of using Federal investments in water projects to improve the economies of depressed areas, although the New Deal emphasis on providing construction jobs for the unemployed was absent. Moreover, in many cases, the emphasis was on water and sewer projects, waste treatment projects, local flood protection works, and small watershed projects, rather than the large multiple-purpose reservoirs of the thirties.

These were the years in which the long-reiterated recommendations of official commissions of experts to centralize Federal water resources policy making and to organize all water development planning on the river basin level began to be implemented. They were also years in which the public (both national and local) appeared to lose interest in water development and become concerned with water pollution control and preservation of natural settings. To a certain extent, the public also lost interest in rivers as such, and become concerned with estuaries, coastal beaches, and the Great Lakes.

This was the period in which the long-held view of one type of water resources expert (that nonstructural methods of flood damage reduction would prove more effective than further construction of dams, levees, and channel projects) began to affect Federal programs and policies. In contrast, the long-held

¹Hereafter, footnotes (signified by superior numbers) will contain explanatory materials only. All citations (signaled by numbers in parentheses) will be found in the back of the book, grouped by chapters.

views of another type of water expert (that shortages of water for municipal and agricultural use were a major problem, and that Federal importation of water over long distances was the principal solution to this problem) appeared, for the time being at any rate, to be decisively rejected.

The first volume of this history was divided into five time periods: (1) beginnings of Federal interest in water as a national resource in the nineteenth century; (2) the progressive period, 1901-20; (3) the era of "normalcy," 1921-33; (4) the New Deal, 1933-43; and (5) the post-World War II period, 1944-60. It charted the development of the total Federal water resources program in each time period by:

- (1) Examining briefly the ideological background out of which programs and policies arose.
- (2) Describing executive branch policy-making methods, and, where appropriate, overall water resources program planning methods and achievements.
- (3) Describing water development agency enabling legislation, project authorization and appropriations procedures, economic justification methods, requirements for local cooperation, and long range planning methods and achievements.
- (4) Pointing out certain recurrent themes in the politics of water development, such as the conflict between the executive and legislative branches over control of water development programs, the extent to which political support for programs was either sectional or national, and the tendency for programs formerly supported by national political ideologies to become the object of mainly sectional or local concerns.

The significant events that affected or occurred in Federal water resources programs in the 1960's, however, were more numerous. It seemed impossible to draw an accurate and balanced picture of the Federal water program, in the context of contemporary public affairs, by using the same simple descriptive and analytical scheme that had been used in discussing previous time periods.

Therefore, this history is divided into three sections: (1) The Early 1960's, (2) Water in the National Mind, and (3) Water Resources Agency Programs, 1966-70.

Section I covers 1961-65, with some overlap into early 1966. It begins with a relatively static picture in chapter 1, the Federal water resources agencies, and chapter 2, the report of the Senate select committee and its implementation. The Federal water resources program was expanding, to be sure, and seemingly basic reforms were being made in it. However, this expansion was predictable on the basis of the politics of the 1950's. The reforms being made were consistent with the relatively slow

pace of changes in public opinions and institutions typical of that period.

Chapter 3, *The Wars Over Water*, concerns water controversies, and "crises" that were considered at the time to be the most significant that the Federal water program was involved in. Some of these controversies were continued into the second half of the decade. Their further ramifications are discussed in subsequent chapters. For instance, the resolution and some of the consequences of the controversy over the central Arizona project are taken up again in chapter 6, which concerns the program of the Bureau of Reclamation during the years 1966-70. The controversy over pollution by detergents is taken up again in chapter 8, which concerns the Federal Water Pollution Control Administration in the second half of the decade.

However, apart from the detergents controversy and the Great Lakes water pollution control controversy (which seemed to grow out of the Chicago diversion case), the issues discussed in chapter 3 appeared, at the time, to be further examples of the same kind of conflicts over apportionment of water supplies, or between dams and exceptional scenic resources, that had also occurred in the 1950's.

Section II, *Water in the National Mind*, which is coextensive with chapter 4, provides a bridge between the relatively static period of the early 1960's and the more dynamic period of the later 1960's. Section II provides an overview of the ideological currents that created the Federal water program as it was in 1961 and the continuing effect of these currents on the development of the Federal water program of the 1960's. It also attempts to explain the changes in public opinion that accelerated in the second half of the decade and produced the epoch-making environmentalist program changes of 1969-70.

Section II pays very little attention to the numerous controversies over flood control, navigation, and water supply projects that were especially characteristic of the late 1960's and 1970. (These are discussed in later chapters in the context of the program of the particular agency concerned.) But it does describe a number of other widely publicized environmental controversies of the period and attempts to explain the effect of these controversies on public opinion and Federal Government action. Section II includes an account of presidential policies in the Kennedy, Johnson, and early Nixon administrations. It also includes a discussion of the presidential and congressional processes that resulted in some of the best known program changes of the end of the decade, such as the National Environmental Policy Act, the creation of the Environmental Protection Agency, and the great increase in the sewage treatment plant construction grant program.

Section III, the final and largest section of the book, describes the development of individual Federal water resources agency programs in the years 1966-70. Chapters 5 through 8 are concerned with four of the five major agencies that were given individual coverage in chapter 1. Chapter 9 concerns the fifth agency, the Tennessee Valley Authority, as well as Federal assistance programs for municipal water and sewer systems and the newly coordinated water research agency programs. Chapter 10 describes the jurisdiction and activities of the Water Resources Council, the new interdepartmental planning and policy body whose origins had been discussed in chapter 2.

Each of the chapters of section III can stand alone, but reading the whole section will give a fuller and better balanced picture of each agency's program. This is because section III attempts to show the way policy changes that affected several or all water agency programs had a different effect on each one. Major river basin planning efforts are discussed from the point of view of the principal agencies involved, and, in chapter 10, from the point of view of the Water Resources Council.

It is always somewhat arbitrary to select one particular year rather than another as the beginning of a new period. But 1966 does seem to be the beginning of a new period, because the years 1965 and 1966 produced an exceptionally large number of ambitious water-oriented acts of Congress and several important Executive orders. Indeed, 1966 was intended, by both the executive branch and Congress to be a year of important new program beginnings in both water pollution control and comprehensive river basin planning oriented to the "new" water development purposes of municipal water supply and recreation. Because of Vietnam era budget stringencies, however, less funding was made available for these new programs than had been anticipated.

There can be no doubt about the significance of the years 1969 and (especially) 1970. These were the years in which environmentalism became one of the most important political causes in the Nation's history. Therefore much attention is paid to the fundamental program changes made in virtually all Federal water agency programs in 1970 that were caused or encouraged by the political power of the environmental movement.

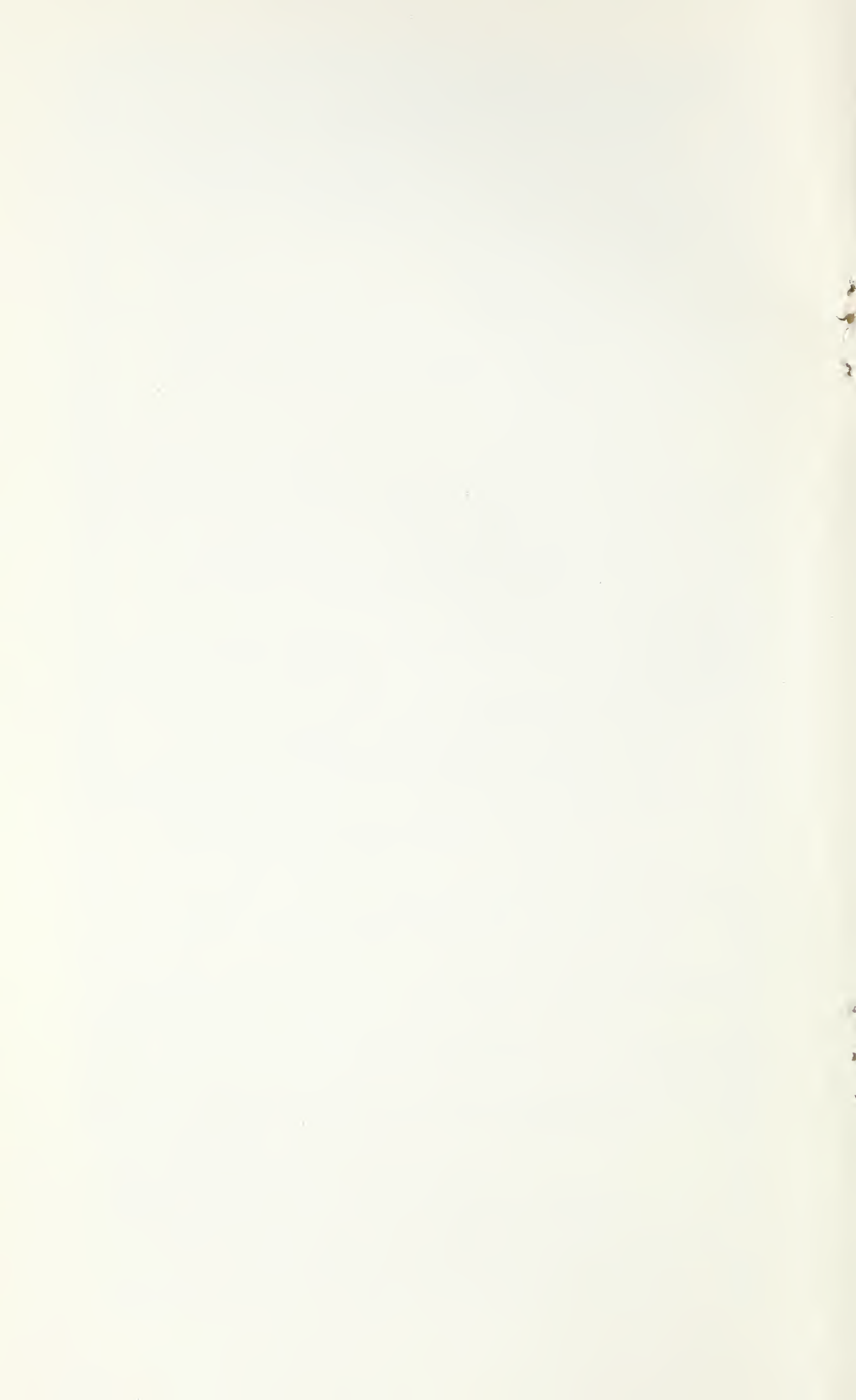
This history brings together information (previously available only in scattered reports and recollections of program administrators) for the use of those concerned with natural resource policy, administrators, and legislators. It is hoped, for this history, as for all histories, that in recounting the errors and achievements of the past, it will help us avoid similar errors in the future.

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PART I. THE EARLY 1960's

1. FEDERAL WATER RESOURCES AGENCIES, 1961-65

The Federal water resources program in the years 1961-65 was first and foremost a water development program. Construction was its most important function, in terms of funding, staffing, and public attention. Maintaining and operating the structures that had already been built was perhaps its second most important function. Thus, the most important executive branch water resources agencies were, without question, the five major construction agencies of the time: Army Corps of Engineers, Bureau of Reclamation, Soil Conservation Service, Tennessee Valley Authority, and Public Health Service. These are the agencies whose programs (together with the program of the Federal Power Commission) were the principal subject of the first volume of this history. They were the principal participants in river basin planning and played the leading roles in the central water planning organizations of the day: the Interagency Committee on Water Resources and ad hoc Water Resources Council (see chapter 2).

But there were also a great many other Federal agencies that had important water resources missions in research, planning, and small water facilities development. They and/or their successor agencies were to play a significant role in the decade of the 1960's, with its increasing emphasis on the input of research and planning into Federal developmental and regulatory efforts and on Federal support of State and local water development and management. It seems appropriate, therefore, to generally delineate programs of the minor water agencies before embarking on a detailed analysis of programs of the five major agencies. The ensuing description is brief and necessarily superficial.

Minor Water Resources Agencies

In addition to the Soil Conservation Service, the Department of Agriculture had at least five other agencies with important responsibilities in the field of water resources. The Agricultural Stabilization and Conservation Service worked directly with farmers to enable them to install water conservation measures.

The Farmers Home Administration made grants and loans to organizations of farmers for similar purposes. The Forest Service participated in research, planning, conservation, and development functions affecting water resources in the national forests. The Economic Research Service studied the economic and institutional aspects of water resource use and management and participated in regional, river basin, and small area water planning. The Agricultural Research Service participated in watershed engineering research and scientific and engineering research in water use and management.

Several agencies of the Department of Commerce also had water resources responsibilities. The Housing and Home Finance Agency made planning advances and low interest loans to small communities for water and sewer facilities. The Area Redevelopment Administration, created in 1961, also made loans and grants for needed public works in depressed areas—water and sewer facilities included. The Office of Business Economics prepared economic base studies for river basin studies. The Weather Bureau provided flood and storm forecasts. The Coast and Geodetic Survey provided basic data concerning coastal and estuarine areas and some inland bodies of water.

The Department of Interior was the Federal department with the greatest number of agencies with water-oriented programs. The Bureau of Reclamation was its leading water and power development and water power marketing agency. But the Bureau of Indian Affairs also built and administered irrigation projects, and power marketing responsibilities were shared with the Southeast, Southwest, and Bonneville Power Administrations.

Interior's Bureau of Land Management administered water resources use, conservation and development on U.S. public lands. The National Park Service (NPS) administered water resource use and conservation in the national parks. At the beginning of the 1960's, the NPS was responsible for recreation planning at reclamation projects (and some Corps of Engineers projects) and for the recreation component of Bureau of Reclamation and interagency river basin plans. But responsibility for these functions was transferred in 1962 to the newly formed Bureau of Outdoor Recreation (BOR); the water planning authority of BOR was further expanded by additional legislation passed in 1965. The Bureau of Sport Fisheries and Wildlife (BSF&W) was responsible for determining the impact of Federal and federally-licensed water developments on fish and wildlife and for recommending measures to enhance these resources or mitigate damages to them. In areas where commercial fishing was important, BSF&W exercised these functions in cooperation with the Bureau of Commercial Fisheries. Both of

these Bureaus were components of the Fish and Wildlife Service and both participated in research on aquatic ecology and the effect of pollution on fishlife. The Bureau of Mines was occasionally involved in mineral resources investigations as part of water project and river basin studies. It also did research on the water requirements of the mineral industry, the effects of impoundments on mineral resources, mine drainage, and water pollution by minerals.

Interior's Geological Survey (GS) was the leading hydro-science research agency of the Federal Government with responsibility to collect and disseminate information concerning the source, quantity, quality, distribution, movement, and availability of both surface and ground waters. GS investigated the magnitude and frequency of floods and droughts with relation to climatic and physiographic factors. It studied water resources requirements for various purposes, the physical and chemical quality of water, and the interrelationships between climate, topography, vegetation, soils, and water supply. GS also gave technical assistance in hydrologic fields to other Federal agencies and coordinated the national water data acquisition work of all Federal agencies. The Office of Saline Water was responsible for desalination research, both in-house and extra-mural.

Because the Interior Department had so many agencies with some responsibility affecting river basin planning, the Department also maintained a number of regional field committees to coordinate its programs in water resources development. The field committees consisted of representatives of all agencies operating within designated regions.

Two international agencies were responsible for the implementation of treaties dealing with the waters on our southern and northern boundaries.

The U.S. section of the International Boundary and Water Commission carried out American responsibilities concerning U.S.-Mexican waters. These included construction, operation, and maintenance of diversion dams, storage reservoirs, hydroelectric plants, flood control and navigation works in the boundary waters of the Rio Grande, and flood control works on the lower Colorado. Also included were administration of international water allocation and regulation of water use along the boundary as agreed upon by treaty. The Commission also investigated international sewage and industrial waste problems.

The International Joint Commission (IJC) was set up to prevent disputes regarding the use of U.S.-Canadian boundary waters and settle questions involving rights, obligations, and interests of both countries in the boundary waters. IJC approval was required for construction and maintenance of any works

that changed the natural level of boundary waters. IJC had no direct water resources development or pollution control responsibilities but could make reports and recommendations to the two governments dealing with these and other international water problems.

There were also several agencies with important water resources functions in the Executive Office of the President. The responsibility of the Bureau of the Budget, under Executive Order 9384, for reviewing all Federal water resources project and program reports before submission to Congress for authorization has been described in the first volume of this history. In addition, the Budget Bureau worked with the water resources agencies (as it also did with all other executive branch agencies) to conform their annual budget requests to the requirements of the Budget of the United States. The Office of Science and Technology served as staff for the Federal Council for Science and Technology, which was authorized to promote closer cooperation among Federal agencies in scientific and technological matters. The work of this organization to coordinate water research programs will be discussed in chapters 2 and 9. The Office of Emergency Planning (OEP) was responsible for planning for overall management of all resources in periods of emergency and also providing for Federal assistance in natural disasters, including floods and droughts. OEP coordinated the activities of the agencies which did the actual field work. In the case of floods, the field work was usually performed by the Corps of Engineers.

In addition, there were several independent agencies with water resources missions (apart from the Federal Power Commission, whose activities were discussed in detail in the first volume of this history, and the Tennessee Valley Authority, discussed later in this chapter and in chapter 9). The Atomic Energy Commission was responsible for control of radioactive water pollution to protect public health and was also involved in research looking to the construction of combined desalination and power generation plants. The St. Lawrence Seaway Development Corporation was authorized to construct, maintain, and operate deep water navigation works and to perform necessary dredging in the U.S. section of the international St. Lawrence Seaway. The Corporation coordinated its activities with the St. Lawrence Seaway Authority in Canada, the Hydroelectric Power Commission of Ontario, and the Power Authority of the State of New York. The National Science Foundation conducted a program of extramural research and development in weather modification and supported the National Center for Atmospheric Research.

Two agencies of Congress also had missions affecting water resources: the Legislative Reference Service (LRS) of the Library of Congress and the General Accounting Office (GAO). LRS was a team of experts in various areas of Government that provided congressional committees and individual Congressmen with background information needed to perform their legislative function. GAO investigated, reviewed, and analyzed programs and activities of the Federal Government and federally funded activities to determine whether Federal funds were achieving intended results and were efficiently and economically administered. In the last years of the decade, Congress was to make considerable use of the GAO's investigating function to bring into focus congressional dissatisfactions with the Federal water pollution control program and to prod the executive branch into changing directions.

Although there were many agencies with water resources responsibilities, the history of the national water program in the 1960's reveals that the programs of the minor agencies had their greatest effect on the national water program when they influenced or collided with the programs of the major water agencies. The first volume of this study, "A History of Federal Water Resources Programs, 1800-1960," contains a description of some of the basic aspects of the five major water resource agency programs as they were in 1960. These aspects include the enabling legislation of each program, the project authorization and appropriations process, agency methods of economic justification of projects, the amount of local contribution required, and the relationship of each program to central executive branch planning and policies. The present volume will also discuss these matters and draw attention to the changes that occurred. However, it seems useful to begin the history of the 1960's by examining certain other basic aspects of the water agency programs in the early years of the decade. These are the scope and intensity of the activities of each program, the amount of Federal funding of each program, the character and geographical location of the physical structures each program had produced, and the relationship of these and other factors to the public support for each program.

The Corps of Engineers

The largest Federal water development program, by far, was the civil works program of the Army Corps of Engineers. This program included planning, constructing, maintaining, and operating works of improvement for flood control, navigation,

and multiple purposes (that is, those with hydroelectric power).¹ The Corps was specifically authorized to include provisions for municipal and industrial water supply, fish and wildlife, recreation, irrigation,² and—after 1961—low flow regulation for water quality control in its flood control, navigation, and multiple-purpose reservoirs. In addition, it was permitted to include provisions for other related purposes. The Corps also cooperated with localities and States to plan and construct hurricane, flood control, and beach erosion control projects.

Furthermore, the Corps civil works program included flood-fighting and other emergency operations, control of water pollution from hydraulic mining operations in California, and operation and maintenance of the Washington, D.C., water supply. The Corps was also responsible for the administration of laws protecting the navigability of navigable waters, by requiring permits for dredging and filling operations, bridges, dams, dikes, causeways, and discharges or deposits of refuse. Finally, the Corps carried out an extensive program of research, data gathering, and preauthorization planning activities. In some cases, these were basinwide and conducted under the auspices of an interagency committee, international treaty organization, or cooperatively with other Federal, State, or local agencies. A small program of flood plain studies to provide data on flood hazards for use of States and local governments in land use planning and regulation was initiated in fiscal year 1962. Corps of Engineers districts began work on 49 flood hazard studies during the first year. By fiscal year 1965, 47 studies were completed and 87 were in process (1).

The appropriation for the entire civil works program in fiscal year 1961 totaled \$936 million. Of this, \$756 million (81 percent of the total) was for construction—including post-authorization planning; \$151 million (16 percent of the total) for operation and maintenance; and the remaining \$29 million (3 percent of the total) for everything else—including preauthorization planning, research and administration, and administration of laws protecting navigable waters (2). This degree of emphasis on construction remained constant during the early 1960's, despite the inauguration of the flood plain studies program and the leading role played by the Corps in interagency planning activities at that time. By fiscal 1965, appropriations had increased to \$1.25 billion, of which approximately \$1 billion was

¹If projects did not include hydroelectric facilities they were not classified as multiple-purpose projects for program and budget purposes, no matter how many other purposes they served.

²Provision of facilities for irrigation required special authorization in each case under the Flood Control Act of 1944, 43 USC 390.

allocated to construction and \$250 million to "maintenance and other" functions (3).

A comparison of the funding of the Corps water development projects for 1963, the middle year of this period, with that of the four other leading water development agencies discussed in this chapter, in terms of actual spending rather than appropriations, is shown in table 1. This shows that budget expenditures in fiscal 1963 for Corps water development projects were \$852.9 million, 64 percent of the \$1.32 billion total. By contrast, Bureau of Reclamation project expenditures were \$337.7 million (including power transmission facilities); Soil Conservation Service expenditures were \$57.5 million; and TVA expenditures for water projects were \$23.2 million (much less than its expenditures for steam plants and power transmission lines). In fiscal 1963, budget expenditures for the Public Health Service's grants to sewage treatment plant construction were only \$51.7 million, or 4 percent of the total for the five agencies (4).

The Flood Control Program

The Corps flood control program, consisting of constructed projects, projects under construction, and active projects not yet started,³ was divided into two components: (1) The Mississippi River and tributaries project,⁴ and (2) the "general" or nationwide program.

The Mississippi project was not one "project" but a large number of levees, floodwalls, channel realignment and stabilization projects, floodways, outlets, and drainage works plus five reservoirs. It was authorized by separate legislation (the Flood Control Act of 1928 and subsequent amendments every few years). Because of its unique nature and the large costs previously incurred by State and local interests in providing for flood protection, it was entirely financed by the Federal Government (5). In 1961, it was estimated to account for about 25 percent of the total cost of the Corps flood control program (6).

In the early 1960's, the Mississippi project consisted largely of completed works, although construction of additional features was continuous (7). A 1964 report to the House Committee on Public Works set forth a program for further continuation of this work (8). The Mississippi project was considered to be the most successful part of the Corps flood control program in reducing flood damages (9). By the early 1960's, it appeared to

³Active projects were those projects in the huge backlog of unfunded, authorized projects that were considered to still have engineering and economic feasibility and the support of local interests.

⁴This project also included the navigation improvements on the lower Mississippi, but they are not discussed here. They are included in the discussion of the navigation program.

**Table 1. Federal budget expenditures for water resources and related developments,
fiscal year 1963**

| Item | Million dollars |
|---|--------------------|
| Flood control works: | |
| Corps of Engineers—Civil | 351.3 |
| Grants | 17.0 |
| Bureau of Reclamation. | 1.2 |
| Soil Conservation Service (mostly grants) | 54.0 |
| International Boundary and Water Commission. | .7 |
| Tennessee Valley Authority | 2.6 |
| Total, flood control works | 426.8 |
| Beach erosion control: | |
| Corps of Engineers—Civil | 1.3 |
| Irrigation and water conservation works: | |
| Bureau of Reclamation. | 71.7 |
| Loan and grant program | 14.4 |
| Soil Conservation Service (mostly grants) | 3.5 |
| Bureau of Indian Affairs | 4.0 |
| Total, irrigation and water conservation works | 93.6 |
| Navigation facilities: | |
| Corps of Engineers—Civil | 227.4 |
| Saint Lawrence Seaway Development Corporation. | 1.4 |
| Tennessee Valley Authority | 7.6 |
| Total, navigation facilities | 236.4 |
| Multiple-purpose dams and reservoirs with hydroelectric power facilities: | |
| Bureau of Reclamation. | 150.4 |
| Corps of Engineers—Civil | 272.9 |
| International Boundary and Water Commission. | 10.3 |
| Tennessee Valley Authority | 13.0 |
| Total, multiple-purpose facilities | 446.6 |
| Steam-electric powerplants: | |
| Tennessee Valley Authority | 74.8 |
| Power transmission facilities: | |
| Tennessee Valley Authority | 30.2 |
| Bureau of Reclamation. | 47.2 |
| Bonneville Power Administration. | 15.2 |
| Southwestern Power Administration | 1.2 |
| Total, power transmission facilities. | 93.8 |
| Waste treatment facilities: | |
| Public Health Service, grants | 51.7 |
| Total, water resources and related developments | 1,425.0 |

Source: Bureau of the Budget, The Budget of the United States for Fiscal Year 1965.

have long since brought to a halt the frequent catastrophic floods that had earlier occurred in the cities of the lower Mississippi Valley. The Chief of Engineers' annual report for 1961 noted, for example, that the year's spring rains had resulted in the highest crest stages on the lower Mississippi since 1950, but that, as a result of existing protective works, flood damages were negligible (10).

The general flood control program, begun in 1936 and authorized for individual projects in the annual omnibus flood control acts, contained a much larger proportion of reservoir works than the Mississippi project.⁵ It also contained a much larger proportion of uncompleted works that were either under construction or on the active list, and awaiting appropriations for construction. At the end of fiscal 1961, the Corps had completed about 400 specifically authorized flood control projects, of which 132 were reservoir projects (11). At the end of fiscal 1965, it had completed an additional 73 projects, including 34 reservoir projects; 134 additional flood control projects were under construction (12).

General program flood control projects in operation or under construction in the early 1960's were scattered throughout the Nation but were especially concentrated in the Ohio, Missouri, the Arkansas-White-Red and the upper Mississippi basins. Lesser concentrations were in two California basins, the basins of the South Atlantic, New England, and the Gulf-Southwest regions (13). There were relatively few flood control projects in the Middle Atlantic States. Several ambitious ones in the Delaware basin, which also had important municipal water supply and recreation features, were authorized by the Flood Control Act of 1962 (14). The projects had been promptly funded for post authorization planning operations but were not yet under construction (15). A 1963 report recommended the eventual construction of 16 major reservoirs in the Potomac basin, some for flood control, and some for low flow augmentation for quality control and recreation purposes only. Eight of these reservoirs (in addition to the one that had been authorized in the Flood Control Act of 1962) were recommended for immediate authorization for construction (16). However, disputes with conservationists held up the authorization of these projects.

Multiple-Purpose Projects

The Corps multiple-purpose dams and reservoir projects with hydroelectric facilities were primarily designed to serve flood control and/or navigation in combination with water power

⁵The allocation of costs between Federal and local interests in the general flood control program is described in the first volume of this history.

generation. By the end of fiscal 1965, the Corps had constructed 49 such projects, of which 43 were generating hydropower, and had 18 others under construction (17). These were mostly large projects and in the early 1960's, the Corps spent about 70 percent as much of its annual budget on them as on its flood control program (18). Most multiple-purpose projects under construction in the early 1960's were in the Missouri and Arkansas-White-Red River basins and the Pacific Northwest (19).

Navigation Projects

At the beginning of the 1960's, the Corps spent a little less on its navigation improvements program than its multiple-purpose reservoir projects. But by fiscal 1965, it had begun to spend more (20). The Corps navigation improvements program consisted of three major components: Great Lakes harbors and channels, coastal harbors and channels, and inland and intracoastal waterways. Navigation works at both coastal and Great Lakes harbors and channels generally involved dredging channels and anchorages and protecting entrances and anchorages by jetties and breakwaters. Rivers were improved for navigation by dredging, regulating works, and canalization by locks and dams.

Great Lakes improvements and coastal harbors were an oceangoing system with different carrier and traffic characteristics. They were not generally integrated into multiple-purpose projects or comprehensive river basin developments and were therefore considered to be not strongly related to other Federal water resources programs. However, many inland navigation improvements were parts of larger projects with flood control, power, recreation, fish and wildlife, and other features (21).

The Corps inland and intracoastal waterways system consisted, throughout the early 1960's, of about 22,000 miles of waterways that had been improved and were continuing to be improved in varying degrees. About 19,000 miles of these waterways were in commercial use (22). Much of this network carried very little tonnage, however (23). The heavily used waterways (the Mississippi, Illinois, Ohio, and Tennessee Rivers and the Gulf Intracoastal Waterway) carried most of the commercial traffic (24). About 80 percent of the commodities shipped on them were petroleum, petroleum products, bituminous coal, lignite, sand, gravel, crushed rock, iron, iron ore, and steel (25).

Most of the waterway construction projects in the early 1960's involved work to widen or deepen channels or to modernize channels with higher dams and larger locks. But local water resource development interests were succeeding in efforts to secure additional navigable channels. Construction of the first

few units of a system of 19 locks and dams on the Arkansas and Verdigris Rivers was under way and was scheduled to provide an additional 450 miles of navigable channel from the Mississippi River to Catoosa, Oklahoma, when completed in 1970 (26). Construction had just begun on the Cross-Florida Barge Canal, a 185-mile, 12-foot deep waterway, which would link the Atlantic Intracoastal Waterway with the Gulf of Mexico (27). The Trinity River Waterway project which would provide a 370-mile navigable channel from Fort Worth, Texas, to the Gulf of Mexico was on the active list, and the Tennessee-Tombigbee Waterway project was returned to the active list in 1965 (28).

The expansion of the Nation's waterway system that began at this time was perhaps more the product of congressional supporters of navigation improvements than of the professional judgment of the Corps itself. During the early 1960's, the Corps attempted (with limited success and against considerable congressional opposition) to introduce more restrictive criteria for the economic justification of navigation projects than had hitherto prevailed (29). (This issue is discussed in chapter 5.) The Corps attempt was to be defeated with the passage of the Department of Transportation Act in the latter half of the decade.

The Politics of the Corps of Engineers Projects

The role of Congress in the selection of Corps projects and the special interest of Congressmen in the Corps, as the builders of public works wanted by the people of their own districts, is discussed in the first volume of this history. By the early 1960's, after more than 15 years of interagency cooperation in planning and policymaking, the Corps no longer thought of itself as "an agency of the legislative branch." From 1962 until the passage of the Water Resources Planning Act of 1965, the Corps played a leading role in the ad hoc Water Resources Council's preparations for future nationwide comprehensive river basin plans. However, it was (and still is) true that the initiative in the authorization and implementation of Corps projects came from those local interests who felt that a local need existed for improvements for navigation, flood control, beach erosion control, or related water developments.

To obtain such improvements, local project promoters required the cooperation of a Congressman of the district to request a review of previous survey reports or, if no previous survey had been made in the area, the inclusion of a survey in the next omnibus rivers and harbors act. The promoters also required the cooperation of the Public Works Committees of the House and Senate (for authorization of surveys and projects)

and of the Subcommittees on Public Works of the Appropriations Committees of both houses for funding for each individual project.

The local supporters of projects frequently were chambers of commerce, local government officials, newspapers, merchants' organizations, and businessmen representing real estate, construction, and carrier companies. They were generally organized into associations for public education and lobbying purposes, such as the Mississippi Valley Association, Ohio Valley Improvement Association, Columbia Basin Development League, Missouri-Arkansas Basins Flood Control and Conservation Associations, Coosa-Alabama River Improvement Association, Tennessee-Tombigbee Association, Trinity Improvement Association, and others.

The most influential lobbying organization was probably the National Rivers and Harbors Congress, of which all members of Congress were *ex officio* members. This organization represented many local water resources associations, State and local government agencies, industries, shippers, civic groups, financial institutions, as well as the congressional rivers and harbors establishment (since many of its officers and committee chairmen and its national vice presidents were U.S. Senators and Representatives). The National Rivers and Harbors Congress conducted its own evaluation of proposed projects through its projects committee, decided on those it would support at its annual meeting, and testified in support of them before the Bureau of the Budget and Congress (30).

The Bureau of Reclamation

In the 17 contiguous Western States, plus Alaska and Hawaii, the Bureau of Reclamation was responsible for another large water resources public works program. This included planning, constructing, maintaining and operating works of improvement for irrigation, hydropower development, municipal and industrial water supply, navigation, flood control, fish and wild-life preservation and propagation, and—where specifically authorized—recreation. The works included diversion and storage dams, power plants, irrigation canals, aqueducts, pumping plants, and electrical transmission lines. In addition, the Bureau provided loans and technical assistance to local water users' associations for planning and constructing of water distribution systems and small irrigation projects.

The Bureau's planning program included comprehensive basin investigations, preauthorization project planning, and detailed postauthorization preconstruction studies.

Preauthorization planning was coordinated with other Federal water agencies and State governments by statute and by the Interagency Committee on Water Resources. In 1961, at the beginning of a new Federal emphasis on comprehensive planning activities, the Bureau was already engaged—with various degrees of cooperation with other agencies—in comprehensive surveys in 10 western river basins (31).

In addition to its planning and construction responsibilities, the Bureau marketed electricity from its own hydropower plants, Corps of Engineers power plants at dams on the Missouri River, and the International Boundary and Water Commission's Falcon powerplant. The Bureau also conducted research in engineering, hydrology, and such water conservation concerns as evaporation reduction, desalination, and weed control—in some cases in cooperation with other concerned Federal agencies.

Besides its responsibilities for water development and management, the Bureau had other responsibilities based on its traditional interest in the economic and social advancement of the West. Thus, it created and administered new towns at construction sites of large projects. (The only one still in Federal operation in 1961 was Page, Arizona, in the vicinity of the incompleted Glen Canyon Dam) (32). The Bureau established model farms at new irrigation projects and engaged in agricultural research and farmer service activities in cooperation with State land-grant colleges and extension services and USDA agencies (33).

Since World War II, the great bulk of irrigation projects had either furnished supplemental water supplies to lands already irrigated or had irrigated drylands already in private ownership. However, the Bureau of Reclamation still provided some of the opportunities for land settlement on family farms that had been such an important objective of the reclamation program in its early years. Thus, during fiscal 1961, the Bureau conducted two land openings, one on lands acquired by the Government under the Columbia Basin Project Act of 1943 and the other on public lands. The first made 12 full-time farm units in the State of Washington available for purchase at controlled nonspeculative prices. The second offered 14 farm units on the Minidoka project in Idaho for entry, without fee, under homestead and reclamation laws (34).

There can be no doubt, however, that the Bureau was predominantly a water project construction agency like the Corps of Engineers. The funds spent or obligated by the Bureau in fiscal 1961 totaled slightly less than \$300 million, of which, Commissioner Dominy estimated, 80 percent was for construction and rehabilitation of projects. The remainder included

\$34 million for operation and maintenance, \$11.6 million for loans to local interests for small projects and distribution lines, and less than \$15 million for general investigations, research, and administration (35).

The early 1960's were a period of growth in all the Bureau's water programs. Appropriations in fiscal 1961 rose \$25 million above the 1960 appropriations. By fiscal 1964, they had risen another \$85 million (36). The Department of Interior's first *Conservation Yearbook* (for fiscal 1964) made it clear that it was administration policy to use the reclamation program to meet the water resources needs of a western population expected to double by the year 2000. The yearbook particularly declared its satisfaction with four accomplishments of the Kennedy and early Johnson administrations:

- (1) That by the end of fiscal 1965, the 4-year record of the Bureau in supplying irrigation, municipal and industrial water, and hydropower to the West would be 47 percent above the level of the preceding 4 years.
- (2) That 29 percent more funding would have been appropriated (or recommended in the President's 1965 budget), than in the preceding years.
- (3) That in 4 years, funds had been made available for 17 new reclamation project starts. (These included two transmountain diversions: the San Juan-Chama, which transferred water from the upper Colorado basin to the headwaters of the Rio Grande, and the Fryingpan-Arkansas project—the largest ever undertaken in the West—which imported water from a little-used Colorado basin tributary to a long-established irrigation economy in the Arkansas basin.)
- (4) That the Pacific Southwest water plan had been completed and adopted enthusiastically by the Secretary of the Interior. This interbasin plan called for intensive development of the water resources of the 5-State area that was both the fastest growing and the driest in the Nation. The Secretary urged the plan's early implementation to forestall economic stagnation in the Southwest (37).

Irrigation

In the early 1960's, approximately one-fifth of all irrigated land in the United States was served by reclamation project water. Reclamation irrigated lands were dispersed among the 17 contiguous western States, although over 60 percent of them were concentrated in four States: California, Idaho, Colorado, and Washington, in that order (38).

The 1902 Reclamation Act provision that the total acreage eligible for delivery of water is 160 acres in one ownership⁶ and that the landowner must be the occupant of the land (39) had never been changed. The law did not limit the acreage which a person may own—only the acreage to which water can be delivered. The Excess Land Law of 1926 (40) had provided that in order to receive project water for irrigated tracts, the owner must agree to dispose of lands in excess of 160 acres.⁷

However, Congress had authorized exemptions from and modification of the acreage limitation at a number of projects where it was believed to work a real hardship (41). In other cases where the excess land law was formally complied with, defenders of the principle of acreage limitation pointed out that landowners had found ways to evade the intent of the law (42).

The acreage limitation had always been controversial. By the early 1960's, a considerable body of opinion (including the views of the National Reclamation Association and land-grant colleges) maintained that mechanization and the business character of modern agriculture had made the homestead-sized farm an inefficient enterprise. Realism and the public interest therefore required modification of the excess land law. But others believed that the subsidies provided to irrigators by the reclamation program⁸ were not intended for large-scale "agribusinesses" and could not be justified unless the program remained true to its social mission (43).

In 1962, the Senate Committee on Interior and Insular Affairs instructed the Secretary of the Interior to study acreage limitation policy and recommend changes if he concluded they were needed. The Secretary's report in 1964 made two recommendations:

- (1) That class I (the most productive) lands continue to be subject to the existing 160 or 320 acre limitation, but that other, less productive lands be allowed to receive irrigation water for a proportionately larger amount of

⁶By administrative interpretation, 320 acres for man and wife and 160 additional acres for each child.

⁷This law provides that lands in excess of the acreage limitation can only become eligible to receive project water if the landowner executes a recordable contract with the United States to sell the land at appraised dryland prices. As the law does not specify when the excess land must be sold, the Secretary of Interior determined that it must be within 10 years of the contract and that he had a power-of-attorney to sell it if the owner defaulted on the contract. In actuality, as of the early 1960's, the Secretary had never exercised his power-of-attorney. See (42).

⁸These subsidies were: (1) interest-free financing of irrigation costs with repayment of the principal over a long period of years; (2) repayment of part of the principal by revenues from hydropower and municipal and industrial water; and (3) allocation of part of the 'joint costs' of multiple-purpose projects to non-repayable purposes such as flood control, navigation, fish and wildlife, and water quality.

acreage. Congress had already specifically authorized this system, called the class I equivalency concept, to be used in several projects.

- (2) That a revolving fund be established to enable the Secretary of Interior to purchase lands and resell them to eligible purchasers (44).

However, the changes proposed in the Secretary's report were not enacted and acreage limitation policy was not changed.

Livestock forage was grown on 46 percent of all irrigated land on reclamation projects. Other important crops included cereals (predominantly barley, wheat, and corn), 25 percent; cotton, 8 percent; vegetables, 8 percent; sugar beets, 7 percent; beans, 5 percent; and fruits, 4 percent (45).

Both scholarly and political critics of the program maintained that reclamation projects increased the production of crops that USDA had defined as surplus (46).⁹ USDA was attempting to control the production of cereals, cotton, sugar beets, and beans under its crop support and acreage control programs and the Sugar Act.

For this reason, the Bureau and its supporters regularly pointed out that the percentage of surplus commodities produced at reclamation project farms was actually very small. Of the 5 major surplus crops under the Commodity Credit Corporation program (wheat, corn, cotton, sorghums, and tobacco) only 2 percent were produced at reclamation projects (47). Furthermore, Bureau spokesmen pointed out that irrigation of dryland frequently resulted in switching lands from production of wheat and corn (the principal products in surplus) to livestock products, fruits, and vegetables (48).¹⁰

The Bureau and its supporters were inclined to believe that in the future, as a result of population growth, crop surpluses would not be an important problem. The growth of population and affluence would, they believed, lead to additional demand

⁹Criticism of the Bureau's provision of irrigation water for cotton was particularly intense and was to become even more so as the 1960's unfolded. Assertions were made that the growth of the cotton industry on reclamation projects forced many poor, black southeastern cotton producers off the land.

¹⁰This assertion became the focus of controversy in 1965 when the long-awaited Garrison Diversion unit of the Missouri basin project in North Dakota was reauthorized. Proponents of the unit predicted that it would result in the replacement of dryland farming of wheat (which was in surplus) with feed grains and forage for livestock production and row crops. Opponents replied that it was absurd to believe that surplus crops would not be grown on the project. They pointed out that feed grains, beef and lamb, dairy products, potatoes, and sugar beets were also commodities for which the Department of Agriculture had been trying to maintain minimum prices by encouraging curtailment of production. They also pointed out that the Government had that year paid North Dakota farmers \$20 million under wheat and feed grain acreage diversion programs and \$15 million for not using soil bank land for forage.

for food and fiber and particularly for the meats, dairy products, vegetables, and fruits produced at reclamation farms (49).

Of perhaps even more importance, Bureau spokesmen pointed out that, in the past, irrigating western dryland had led to the growth of agricultural economy-based towns and eventually to full scale urbanization and industrialization. They contended that the rapid expansion of U.S. population would require greater geographical population dispersion to maintain the quality of life and that the history of the West had proved that investment in irrigation was an effective way to achieve such dispersion (50).

Hydroelectric Power

The second most important activity of the Bureau was, and is, power production. In fiscal 1961, the Bureau was operating 42 powerplants with an installed nameplate capacity of 5 million kilowatts; it was building 9 more and adding another unit to the Hoover Dam powerplant, with an expected capacity of 1.7 million kilowatts (51). The Bureau's powerplants, for the most part located at its largest multiple-purpose dams, were concentrated in the central valley of California, and the Colorado, Columbia, and Missouri basins.

In the early 1960's, the Bureau's largest hydroelectric construction activity was the construction of the upper Colorado dams and powerplants authorized by the Colorado River Storage Project Act of 1956. In addition, the Bureau substantially completed the Yellowtail unit of the Missouri River basin project in Montana.

As a power marketing agency, the Bureau also constructed, operated, and maintained transmission systems to move energy from its own plants and those of the Corps in the Missouri basin to load centers. The Bonneville Power Administration (BPA) was responsible for transmitting and marketing power produced at the Bureau's (and Corps) dams in the Columbia basin. In the early 1960's, the Bureau built the transmission grid of the Colorado River storage project system and worked on construction of a line to connect the upper Colorado and Missouri basin transmission grid.

In 1961, Interior began studies of interconnections of high voltage transmission systems operated by the Bureau and BPA. In August 1964, Congress approved the Interior Department's plan for the great Pacific Northwest-Pacific Southwest intertie to take advantage of hydropower's superior ability to meet peak demands for electricity. Four major lines would carry electricity from Federal powerplants on the Columbia River to load centers in California and Arizona. Minor lines would also connect to existing transmission systems in 11 Western States. The intertie

was to be built by BPA, the Bureau of Reclamation, the city of Los Angeles, and private utilities of the Southwest at an estimated total cost of \$700 million (52).

The belief in Federal water power development as the key to regional economic development, which was such an important motivation of the Roosevelt and Truman administration river basin planners, has been discussed in the first volume of this history. Secretary Udall, in his first announcement of the Kennedy administration's power policy, reflected his party's traditions in supporting "full Federal participation in maximum use of our available hydropower resource, and disposal at the lowest possible economic rate" (53). Nevertheless, Bureau spokesmen at this time generally made their case for new hydropower dams not so much on the basis of the value of power as the capability of power to pay for irrigation development (54).

For 20 years reclamation law had provided that projects could not be authorized unless irrigation costs would "probably" be repaid. However, irrigation costs beyond the ability of the water users to repay could be assigned to repayment from revenues from power and municipal and industrial (M and I) water after the power and M and I water costs were repaid. In the Missouri basin, the central valley of California, and the upper Colorado basin, legislation provided that power revenues were available to repay irrigation costs on a basin-wide basis, whereas elsewhere such revenues could only be used to aid irrigation directly associated with the same project generating the power. At the beginning of the 1960's, Bureau spokesmen strongly urged that the basin account principle be extended to the Columbia basin and ultimately broadened to permit pooling of power revenues in aid of irrigation throughout the West. This would make it possible for the Bureau to obtain authorization for irrigation projects in dryland farming areas like the southern Great Plains, where no significant power potentials exist (55). In 1963, the Interior Department administratively established a partial basin account for the Columbia basin. This provided that BPA, the agency responsible for marketing Federal hydropower in the Columbia basin, would pool the power revenues from all Bureau of Reclamation and Corps of Engineers projects. The pooled revenues could then be used to assist repayment of irrigation costs throughout the basin, wherever such irrigation costs had previously been eligible to receive assistance from power generated at the same project (56).

Municipal and Industrial Water

The provision of M and I water had always been a subsidiary purpose of the reclamation program. However, for reasons discussed in the last chapter of the first volume of this history,

this purpose was becoming more important at the beginning of the 1960's. Water deliveries to contracting local governments or large commercial enterprises more than doubled between 1959 and 1964, although they remained a tiny amount by comparison with deliveries to irrigators (57).

The Grass Roots

The Bureau, like the Corps, had close relationships with local supporters of its program and their representatives in Congress. In 1961, the Bureau, in contrast to the Corps, had technical authority to undertake project planning without authorization from Congress. This is now only true for the reconnaissance study, the initial study which determines whether a more detailed investigation is justified.¹¹ However, in practice, the Bureau did not and does not now, for the reconnaissance phase, initiate such studies without approval from Congress. It did not need approval of the House and Senate Interior and Insular Affairs Committees until it was ready to propose authorization of construction of a project. But it had to obtain approval of the Public Works Subcommittees of the two Appropriations Committees to obtain planning funds.

In the early 1960's, most reconnaissance studies were project studies instigated by local groups or agencies, although some were the product of comprehensive river basin plans (58). A local organization that wanted a reconnaissance study could either request one from the Bureau directly (in which case the organization must pay half the cost of the investigation) or persuade its district's Congressman to obtain an appropriation for one (59).

Grass roots promoters of reclamation projects, like supporters of rivers and harbors and flood control projects, organized for lobbying purposes. Some lobbying was done by the irrigation districts that were required by reclamation law to contract for irrigation water with the United States. State, local, and interstate water development or supply agencies also lobbied for reclamation projects that would meet their needs, as did organizations representing potential preference power project customers, such as the National Rural Electric Cooperative Association. In addition, reclamation project supporters were organized into State reclamation associations and their federation, the National Reclamation Association (NRA). The membership of

¹¹Section 8 of the Federal Water Project Recreation Act of 1965 has since provided that feasibility-level studies must be specifically authorized by law. The effect of this enactment is to subject the Bureau's planning to more congressional scrutiny than the Corps'. Although Corps surveys must originally be authorized, the Corps can move them from the reconnaissance to the feasibility stage on its own initiative.

these organizations was largely composed of irrigators; a 1965 NRA brochure states that over 60 percent of its members were officers or representatives of irrigation districts or irrigation canal companies. Other members were State and local government officials, engineers, water rights lawyers, and representatives of newspapers, chambers of commerce, contracting firms, financial institutions, and agriculturally related businesses (6).

State reclamation associations were more involved in lobbying for individual projects than the national organization. NRA took a broader view and lobbied for all policies and programs that tended to promote western irrigation. Thus, NRA worked during the early 1960's not only to increase the rate of project authorization and to provide adequate appropriations for them, but also for the development of irrigation within the framework of basinwide multiple-purpose plans. NRA also supported making power revenues available on a basinwide basis to assist in the repayment of irrigation costs, and the assessment of project benefits and costs over a 100-year period rather than a 50-year period. NRA also favored priority of beneficial consumptive uses of water over instream uses, the integrity of State appropriative water rights against claims of Federal reservation, and efforts to lessen the stringency of the acreage limitation law (61).

The Soil Conservation Service

At the beginning of the 1960's, the Soil Conservation Service (SCS) had a relatively modest program of water projects, the small watersheds program, that had been in operation for less than a decade. The significant provisions of its enabling legislation (P.L. 566, as amended, and provisions for SCS projects under flood control law) are described in some detail in the last chapter of the first volume of this history (62). The same chapter can also be consulted for a description of the participation of SCS and other USDA agencies in cooperative river basin planning with other Federal agencies and States (63).

Watershed Protection Works

The small watershed program provided local organizations and State agencies with technical and financial assistance in constructing small multiple-purpose works of improvement in small stream areas and, for the most part, on private lands. These works could be planned for the purposes of flood prevention, agricultural water management, fish and wildlife development, and present or future M and I water supply (64). In 1962, public recreation was added as a project purpose (65).

P.L. 566 did not require inclusion of flood prevention facilities. However, the Federal Government bore all the construction costs allocated to flood prevention as opposed to half the costs allocated to agricultural water management, wildlife, and recreation, and none of those allocated to M and I water. Thus, the great emphasis of the program was on flood prevention. In 1961, for example, 85.2 percent of the average structural costs of P.L. 566 projects were allocated to flood prevention (66).

Local organizations sponsoring watershed projects on private lands had more responsibilities for those projects than the irrigation districts that contracted for reclamation project water. In addition to paying their share of the construction costs, they contracted for construction and operated and maintained the projects themselves. The sponsoring organizations were required to acquire 50 percent of land rights for public recreation or fish and wildlife development and all land rights for other purposes. They were also required to obtain agreements placing at least half the land above dams and reservoirs under basic soil conservation district conservation plans and providing assurances that most of the land treatment measures in conservation plans would be installed before construction began.

Loans were available through the Farmers Home Administration to help the local organization pay its share of the project cost. Individual landowners were eligible for SCS technical assistance to plan and install required land treatment measures and also, in many cases, for payments from the Agricultural Stabilization and Conservation Service for installing such measures under the agricultural conservation program (67).

Flood prevention works were defined by SCS to include steps to reduce sedimentation. They included such major soil conservation measures as vegetation or structures to control large gullies and severely eroding land, protection of road banks and fills, and shaping and planting waterways crossing two or more farms. They also included floodwater-retarding dams; floodways; floodwater diversions; special water-holding or water-diverting terraces and dikes; and actions to clear, straighten, and enlarge stream channels.

Works for agricultural management included structural measures for irrigation, drainage and supply, and distribution of water for other agricultural uses such as livestock watering. Neither irrigation nor drainage works could be used to bring totally nonproductive or nonagricultural land into agricultural production.

Recreation developments eligible for Federal cost sharing for recreation benefits were required to be open to the public, but landowners were permitted to charge a reasonable admittance

fee (68). However, where flood prevention works, whose entire structural costs were paid by the Federal Government, had incidental recreation benefits, the landowner was free to make whatever personal or commercial use of such benefits he preferred (69).

Public recreation works were limited to 1, 2, or 3 developments per project depending on the size of the project area. Such works could include a single reservoir, lake, reach of shoreline, or stretch of stream—but not the entire stream system of the watershed.

Public fish and wildlife developments were permitted to include added reservoir storage for streamflow regulation, modification of reservoir structures for releasing cold water, stream channel improvement, and marshes and pits to provide wildlife habitat (70).

The small watershed program grew rapidly in the early 1960's. Appropriations for "watershed protection" (a category that included P.L. 566 projects, the remaining pilot watershed projects of 1953, and cooperative river basin surveys and investigations) increased from \$36.7 million in fiscal 1961 to \$71.2 million in fiscal 1965 (71). Appropriations for the 11 larger watershed projects authorized in the Flood Control Act of 1944 also showed a significant increase (72).

SCS intended the small watershed program to be national in scope. Thus, USDA's first *Conservation Needs Inventory* (CNI), begun in 1957 and published in 1962, delineated 12,711 watersheds of 250,000 acres or less. It declared that projects were needed in 8,323 of these watersheds, covering slightly more than 1 billion acres. Of the problems occurring in these watersheds, the CNI viewed flood water and sediment damage as the most extensive, followed closely by critical soil erosion damage. Other development needs in order of prevalence were drainage, irrigation, recreation, and nonagricultural water supply. However, CNI took note of developments since the inventory was begun that had increased interest in nonagricultural water management problems. In these areas (recreation, and M and I water supply), SCS commented that its CNI estimates were probably too low (73).

Despite the national intent of the program, its impact in the early 1960's tended to be regional. Almost a third of Federal funds obligated up to the end of fiscal 1962 were for projects in Texas and Oklahoma. This is a region of serious flood hazard and a multitude of relatively small river basins, in which the program had a great deal of political support (74). In Oklahoma, the State had also made considerable appropriations for project planning (75).

Local and State Participation

To understand the grass roots support for the small watershed program in the early 1960's, it is necessary to examine its planning procedures (which have changed very little since then). P.L. 566 required a greater degree of local participation in planning than the program of either the Corps or the Bureau of Reclamation, as well as a stratum of State Government control that did not exist in either of the latter programs. Thus, section 3 provided that a legally qualified local organization (sponsor) must apply for planning assistance to the State Governor's designated agency (76). The State agency (generally the State soil conservation committee) was responsible for the initial decision on whether to reject the project or recommend it within 45 days for planning assistance to SCS. The act provided that the local organization could be a State agency, political subdivision of a State, soil and/or water conservation district or other special district, nonprofit corporation, or company, or combination of the above (77). In practice, projects generally had joint or multiple sponsors, including one or more soil conservation districts (to insure that lands above the project were put in conservation plans), together with other organizations. The purpose of multiple sponsorship was to ensure that the combined organizations had adequate legal powers, fiscal resources, and administrative skills to meet all the responsibilities of the local organization (78). In addition to the sponsors, who assumed legal responsibility for the project, other local groups were permitted to join in the application, as endorsers of the project, to show community support (79).

The State committee could decide whether to accept the application on the basis of the information in it or request the assistance of a field examination. Field examinations were performed by technical specialists of SCS, the Forest Service, the Fish and Wildlife Service, and State agencies with similar responsibilities, together with representatives of the local organization. Some State committees also held public hearings to determine if there was sufficient local interest and agreement on the proposed project (80).

If the application were approved by the State agency and found to be legally valid by the SCS State conservationist, it would still require a "high priority rating" before it was eligible for scheduling of planning assistance (81).

Establishing priorities and priority criteria was the responsibility of the State committee. However, SCS advised local organizations wishing to sponsor projects that typical State criteria required that sponsors: have the legal authority necessary to build and maintain the projects, desire full multiple-purpose development of the water and related land resources

of the watershed, and demonstrate that soil and water conservation measures are being applied on individual land holdings. In addition, State criteria required sponsors to demonstrate that the project would benefit a substantial number of people and was widely supported throughout the watershed (82).

When the State committee gave an application a high priority rating it was reviewed by the regional directors of other concerned Federal agencies. Only then did SCS conduct a preliminary investigation to determine the physical and economic feasibility of developing a plan to meet the objectives of the sponsoring local organization. If the report was favorable, planning help was authorized by the SCS administrator and the SCS State conservationist provided help to start preparing a watershed work plan (83).

P.L. 566 provided that the local organization prepare the watershed work plan with SCS assistance. In practice, this meant that engineers, hydrologists, geologists, economists, and perhaps other specialists were assigned to an SCS watershed planning staff to work with the local SCS representative and the sponsoring organization. The sponsoring organization reviewed the findings of the specialists at progressive stages of the planning effort. The Farmers Home Administration worked with the local organization when it wished to obtain a watershed loan. Furthermore, SCS notified other Federal and State agencies with water development and conservation responsibilities of the initiation of the study and invited them to participate. U.S. and State fish and wildlife agencies frequently made studies relating to the impact of the proposed project on fish and wildlife resources. The Bureau of Outdoor Recreation sometimes participated in connection with recreation developments.

The plan itself was required to include an itemization of works to be installed during a specific period and their costs and benefits as well as the obligations of the local organization and USDA in carrying out the proposed plan (84).

When completed, the draft work plan was reviewed by higher levels of SCS for technical adequacy and conformity with legal and policy requirements. Then SCS, the local organizations, and representatives of field offices of interested Federal and State agencies conducted an informal field review. Agreement was reached at this stage among all participants. The final plan was then prepared and signed by all the sponsoring local organizations (85).

Project Authorization and Funding

Project authorization procedures under P.L. 566 are described

in detail in the last chapter of the first volume of this history. As noted there, the project authorization process differs with the size of the project (86). The smallest watershed projects could be authorized by the Secretary of Agriculture, which in practice meant that they were approved by the State conservationist. Larger projects were also authorized by the Secretary without additional legislation. However, such projects required State and interagency review, approval of the SCS administrator, and review by the Bureau of the Budget. They were then submitted for approval to congressional committees. They were submitted to the House and Senate Agriculture Committees if of intermediate size and to the Committees on Public Works if in the largest size category. The subcommittee of the House Agriculture Committee invariably held hearings on the projects at which the SCS representative and the Congressman of the district always testified. In the case of Senate Agriculture Committee hearings, a Senator from the State sometimes testified. In addition, testimony was frequently taken from representatives of the sponsoring organizations and other local project supporters, such as mayors, bankers, chambers of commerce, and newspaper editors (87).

Funding for watershed projects involved additional scrutiny of the total annual program, but not of individual projects, by the Bureau of the Budget and another round of congressional hearings, before congressional appropriations committees. Small and intermediate watershed projects were processed through the agriculture subcommittees and larger ones through the public works subcommittees. At hearings on proposed amendments to P.L. 566, larger regional and national supporters of the program testified. These amendments were generally for the purpose of enlarging its scope. The supporters included farm organizations and conservation organizations such as the Isaak Walton League and National Wildlife Management Institute. The most loyal supporters were representatives of the National Association of Soil and Water Conservation Districts, the organization of district officials that had played an important role in securing passage of the original legislation (88).

Resource Conservation and Development Program

Section 102, title I, of the Food and Agriculture Act of 1962 (89) initiated a new SCS program to help State and local public agencies install soil and water improvements in multi-county areas. In the resource conservation and development (RC&D) program, project works were to be used to bring about needed changes in land use and to increase opportunities for economic growth.

Financial and planning assistance was to be available for project works serving all of the purposes of P.L. 566 projects, and, indeed, the RC&D program was to make use of P.L. 566 and other departmental authorities in achieving its objectives. The first, very small appropriation for starting up the RC&D program was made for fiscal 1964 (90).

Although more based on water resources projects than the others, the RC&D program was one of several Federal programs initiated in the 1960's to aid the economies of severely disadvantaged rural areas. The rural development objectives of the program represented the beginnings of a significant broadening of the SCS's traditional soil conservationist philosophy.

The Tennessee Valley Authority

By the early 1960's, the Tennessee Valley Authority (TVA) had become more of a stream flow management agency than a water development agency.¹² It continued to add on and modernize components of its river system and also began a new program of planning and constructing "tributary area" flood prevention and multiple-purpose projects in cooperation with local and State organizations. However its so-called water control system was essentially complete (91).

The water control system consisted of 31 large dams and reservoirs, 9 of them on the mainstem of the Tennessee River and the others on major tributaries, 20 of them built by the TVA. (A 32nd multiple-purpose dam, on the Clinch River, was completed in 1963.) These reservoirs were managed as a unified system to maintain navigation on the canalized Tennessee River, to control floods in the Tennessee, lower Ohio and Mississippi basins, and (to the extent consistent with these purposes) to generate the maximum amount of hydropower.

¹²TVA's mission was not restricted to water resources activities. It included activities promoting the conservation and wise use of all the natural resources of the Tennessee Valley for the purpose of its economic development (in practice mainly soil conservation, forestry, and fish and wildlife enhancement activities). It also included fertilizer and munitions research, development, and production, and the generation (with minor assistance from other sources) and transmission of the valley's entire wholesale electric power supply.

With respect to both construction and operations, TVA's largest program was its power program. The objective of the power program was to promote and supply the greatest possible consumption of power for industrial, agricultural, and domestic use in the valley, at the lowest fiscally responsible rates and also to supply the needs of Federal installations in the valley with extraordinary energy requirements (such as the Atomic Energy Commission).

By FY 1961, only one quarter of the power generated in the TVA system was hydropower. The rest was thermal power fueled by coal procured for the most part outside the valley. Half of the coal was from strip mines.

In winter, reservoirs were operated to provide maximum space for the storage of floodwaters. When danger of floods decreased in the spring, mainstem and upper storage reservoirs were filled. In the drier summer and fall months, water from storage was drawn down to maintain navigation depths and generate hydropower, thus lowering reservoirs in preparation for the next flood season.

When consistent with these major purposes, opportunities for recreation, fish and wildlife enhancement, and improved water supplies for cities were provided as additional benefits.

Precise data needed to manage the system were provided by a network of rainfall and streamflow stations.

TVA regarded the shorelines and water surfaces of the lakes created by its reservoirs and the waterfront sites on its channeled waterway as resources that must be developed for their best possible economic use. It worked with State and local planning agencies to insure that prime industrial sites would be made available to those who could best use them in benefiting the regional economy. By 1963, it reported that flood-free plant sites, navigation, ample low-cost electricity, and improved water supplies for processing and waste disposal had stimulated \$876 million of private investment in waterfront manufacturing plants, terminals, and other facilities serving industry (92). TVA also encouraged the development of shoreline and water surface for recreation and wildlife refuges by States, municipalities, and counties. It estimated that the value of recreation facilities on the lakes and their shores had reached \$156.5 million by 1963 and that fishing had multiplied more than 80-fold since the river was transformed from a running stream to a series of lakes (93).

Recreation and fish and wildlife benefits from TVA developments promised to expand greatly in 1963 when the Congress appropriated and the President approved money for TVA to begin development of its own demonstration recreation project. This was the Land Between the Lakes project, on a 170,000-acre area in Kentucky and Tennessee (94).

TVA's pioneer program of preparing flood hazard reports for local governments and assisting the States and localities in developing flood damage prevention plans was discussed in chapter 5 of the first volume of this history (95). This program was proceeding at a steady rate in the early 1960's. By the end of fiscal 1964, TVA had completed flood hazard reports for 110 out of 150 communities in the valley considered to be vulnerable to damage from localized floods. On the basis of these reports, more than 40 communities had completed planning studies and 38 had adopted flood plain regulations in their zoning ordinances or subdivision regulations (96).

Another program, intended to extend the benefits of stream-flow control and natural resources developments to areas upstream of TVA's water control system, was the tributary area development (TAD) program. TAD, based on the planning efforts of local development associations in cooperation with TVA and State agencies, was an old TVA program, which until the 1960's had mainly focused on improving farm and forest management and reforestation. In the early 1960's, tributary watershed development plans began to include dams, reservoirs, and channel improvements for local flood protection and multiple-purpose water uses (97).

Construction was begun on the first two tributary area water projects in 1963. One was a multiple purpose system of 8 small dams and 70 miles of channel improvements on the Beech River in western Tennessee (98). The other was a channel enlargement, flood prevention project (99). In 1964, another TAD project was based on a plan for flood damage prevention. This included flood plain zoning, channel improvements, flood proofing buildings, and two retention dams (one of which also included a permanent pool for recreation) (100).

TVA provided funds for construction of TAD projects under agreements providing for partial reimbursement by local organizations. It also undertook to design and construct both dams and channel improvements and to maintain the dams. Whereas TVA acquired the land for its main water control system, local development organizations were expected to acquire the land necessary for TAD projects and maintain channel improvements (101).

TVA's mission did not include any regulatory control over water pollution. However, it carried on an active program to reduce and treat wastes produced by its own operations and to evaluate the effects of its water control program on water quality. Technical assistance and consultation were provided extensively to State and interstate agencies concerned with pollution (102).

A 1963 TVA policy statement asserted that waste disposal was an important function of flowing streams and that the availability of water for this purpose was one of the resources of the valley, an invitation to needed economic development. However, the statement strongly urged and supported treatment of effluents by municipalities and industries to prevent the volume of waste discharged to streamflow from restricting other water uses and interfering with the balanced economic and social development that the rivers could otherwise support (103).

Another environmental problem that increasingly concerned TVA was the complex of environmental degradations resulting from strip mining: water pollution, erosion, flooding, and

destruction of scenery. Beginning in 1947, TVA had conducted a number of demonstration strip mine reclamation projects in cooperation with concerned mine operators and landowners. These projects became more numerous and more ambitious in the 1960's (104).

In 1962, TVA appointed a four-man task force to survey the situation and suggest a course of action for TVA and the States concerned. The four members represented forestry, coal procurement, aquatic biology, and engineering. This group issued a report on coal surface mining and reclamation experience in the eastern and midwestern United States, and particularly in the Tennessee Valley, in February 1963.

As a result of this survey, TVA took the position that the States of the valley should adopt legislation requiring restoration of mined surfaces. TVA also undertook cooperative activities with the valley States to develop effective regulatory legislation. However in 1965, since only one State had adopted such legislation, TVA began to include strip mine reclamation provisions in its coal purchase contracts (105).

The Public Health Service

At the beginning of the 1960's, the Federal water pollution control program was still a very modest part of the Federal water resources program. It was administered by the Division of Water Supply and Pollution Control, a small unit in the Bureau of State Services of the Public Health Service (PHS) of the Department of Health, Education and Welfare (HEW).¹³ Until authorizations for construction grants were raised in 1961 legislation, the Division operated with an annual budget of approximately \$70 million. Subsequently and until further expansion of the water pollution control program in 1966, its budget was still only about \$120 million (106).

The Federal water pollution control program included the development of cooperative comprehensive water pollution control plans for all major U.S. river basins; basic data collection, evaluation, and dissemination; in-house research; and administration of fellowships, grants, and contracts for pollution abatement research, training, and demonstration projects. It also included administration of pollution control program

¹³The importance of this division in the internal organization of both HEW and PHS is illustrated by the 1962 edition of the Handbook on Programs of the Department of Health, Education, and Welfare. The 105-page volume on the activities of the Public Health Service contains only two pages on the program of the division.

grants to State and interstate agencies; administration of sewage treatment plant construction grants to local governments; provision of information and technical assistance to other Federal agencies, State and interstate agencies, local governments and industries; and (using the conference procedure described on page 30 of the first volume of this history) enforcement of Federal pollution control law (107).

The water pollution control program resembled other PHS programs in that it combined research, financial, and technical assistance to State and local government programs with a mild regulatory program intended to fill the gaps in the regulatory jurisdictions of State health departments.

The Federal Water Pollution Control Act Amendments of 1961 (108) gave responsibility for all functions exercised under the act (previously the responsibility of the Surgeon General of PHS) to the Secretary of HEW.¹⁴ They also authorized the Secretary to study the need for water quality storage at all Corps of Engineers and Bureau of Reclamation reservoirs. In addition, the amendments increased program grants to State and interstate agencies, expanded research activities, and authorized seven regional laboratories. However, the provisions of the 1961 amendments that received the greatest amount of public and congressional attention concerned the two most controversial aspects of the program: (1) Federal enforcement and (2) financial assistance to treatment plant construction (109).

Previously the Federal enforcement conference procedure could be invoked only in cases of pollution of interstate waters. However, the 1961 act provided that it also be available in cases of pollution of intrastate navigable waters (but only at the request of the Governor of the State).

In addition, the 1961 amendments raised the authorization for treatment plant construction grants from \$50 million a year to \$80 million in 1962, \$90 million in 1963, and \$100 million in 1964 through 1967. The ceiling on aid to individual local sewage treatment projects was raised from \$250,000 to \$600,000. Provision was made for larger grants of up to \$2.4 million to joint municipal projects.

In conformity with the policy statement of its enabling legislation (that primary responsibility for water pollution control and abatement should rest with the States) (110), the Division of Water Supply and Pollution Control worked through State health departments rather than directly with polluters. Thus, construction grant funds were apportioned between the States

¹⁴After this enactment, the Secretary made one of the five Assistant Secretaries of HBW responsible for overall policy direction. The Surgeon General continued to exercise administrative supervision over the division.

and distributed to municipal treatment plant projects approved by the State health or water pollution control agency as conforming to the State agency's own standards for treatment. However, construction grants could not be made for projects proposing less than primary sewage treatment (111).

Enforcement activities centered on conferences between division officials and State health or pollution control officials, rather than the municipalities and industries producing the polluting effluents. Enforcement actions for abatement of pollution of interstate or navigable waters were mandatory only when requested by the Governor of the affected State (112). As a result, and despite the fact that Division officials were able to supply a Senate investigating committee with a list of 90 waterways with pollution problems probably justifying enforcement action, PHS had been involved in only 20 such actions between 1957 and June of 1963 (113).¹⁵ The 10 enforcement actions initiated by the Surgeon General or Secretary of HEW were (with the exception of the Potomac River and Raritan Bay Conferences) not on the most heavily populated or industrialized rivers. With the exception of the Potomac River conference (where the District of Columbia had already made plans for secondary treatment) and the 1963 Coosa River conference, no conference agreements, prior to 1965, required more than primary sewage treatment (114).

Perhaps in response to congressional criticism, PHS began in late 1963 to initiate enforcement actions in highly industrialized and polluted areas and continued to do so until responsibility for the Federal water pollution control program was transferred to the Department of Interior in 1966.¹⁶

The only indicator PHS had of the effectiveness of the enforcement conference procedure, in the early 1960's, was the extent of the remedial waste treatment construction agreed on. As of June 1963, PHS estimated that \$500 million worth of treatment facilities were in various stages of planning, construction, and operation, as a result of conference agreements. Since abatement schedules were expected to take several years, it was considered to be too early to evaluate the final effect of the conferences (115).

PHS also depended heavily on the States to provide basic data. In particular, PHS was totally dependent on the States to provide it with information on the location and character of

¹⁵PHS officials freely admitted to congressional committees in the early 1960's that they were reluctant to initiate enforcement actions where State health departments were hostile to such actions, since cooperation of the State agencies was needed for other important PHS programs.

¹⁶See appendix for list of enforcement actions 1957-70, under the Federal Water Pollution Control Act.

waste discharges and waste treatment facilities. In 1957, PHS had published a national inventory of municipal and industrial waste water discharges prepared by the Conference of State Sanitary Engineers, even though it considered the industrial waste discharge entries to represent no more than a fraction of the plants discharging wastes directly into surface waters. In 1962, the Division considered that industrial waste information submitted by the conference in its updated report was so grossly inadequate as not to merit publication and published the municipal waste discharge inventory only (116).

The municipal wastes inventory and its annual supplements showed waste treatment facility needs by State. Populations with untreated sewage, "inadequately treated" sewage, and "potential sewage" from needed sewer systems were listed in each State, but communities were not identified by name (117).

The Division also became increasingly active in comprehensive interagency river basin planning at the beginning of the 1960's. Although PHS had been authorized since the original 1948 Water Pollution Control Act to prepare comprehensive water pollution control programs in cooperation with States, interstate agencies, municipalities, and industries, this authority had been used only once before 1960. In the early 1960's, however, both the National Conference on Water Pollution and the Senate Select Committee on National Water Resources recommended integrating water quality planning (including planning for water quality streamflow regulation) with planning for multiple-purpose development of the water resources of all major river basins (118). PHS undertook 10 other studies between 1961 and 1965 and prepared schedules for studies of all 20 major U.S. drainage areas. The criteria used to establish priority for comprehensive studies were: the need to resolve critical water problems where pollution had curtailed water uses; the need to integrate PHS planning with planning for water resources development and construction schedules of the Bureau of Reclamation, Corps of Engineers, and Soil Conservation Service; and the readiness of Federal, State, interstate, and local groups to collaborate (119).

PHS justified its river basin studies in the early 1960's on the basis of actual and potential usefulness of information in the studies to Federal reservoir planners, State land use and water quality planners, and localities planning expenditures for sewage treatment works (120). However, PHS made no claim that any coordinating mechanism was provided to insure use of input from the river basin studies in the Agency's own construction grant and State program grant programs.

Another PHS responsibility, under what was then section 9 of the Water Pollution Control Act, was to work with other Federal

agencies to abate pollution at Federal installations (121). Until 1960, the principal activity of PHS under this authority had been to consult with the agencies responsible for Federal installations on a case-by-case basis when it received complaints from the public.

In 1960, President Eisenhower directed the Secretary of HEW to prepare an inventory of the pollution control situation at all Federal installations. PHS responded by compiling a 58-volume inventory of waste discharges as of December 1960, based on information supplied by the administrators of the installations.

This inventory was completed and transmitted to President Kennedy in November 1962. Within a month the President directed the Secretary of HEW to work with the agencies responsible for the facilities to plan and carry out pollution abatement improvements.

In February 1963, PHS established a procedure for carrying out the President's directive. Program directors in the division's nine regional offices were directed to inspect Federal installations, determine whether remedial measures were necessary, and see that necessary abatement schedules were developed and adhered to (122).

In May 1963, the Natural Resources and Power Subcommittee of the House Committee on Government Operations selected 1,003 points the inventory showed were discharging significant amounts of untreated wastes directly into surface or ground waters and requested that PHS investigate them. Between May 1963 and November 1964, PHS inspected 969 of these discharge points (the others were at Atomic Energy Commission installations and were considered to be beyond the technical competence of PHS investigators). PHS's report on the results of these inspections was that Federal installations had made considerable progress since the December 1960 inventory and that only 68 (mostly military) installations had taken no steps to correct inadequate waste disposal methods (123).

However, as the Federal installations pollution abatement program progressed, less progress was made than expected in installing remedial measures. This was mostly because of difficulties in funding them. When budgets for Federal facilities were cut, agencies responsible for the facilities (whose primary mission was not pollution control) were reluctant to insist that sewage treatment plant items be retained in the budget (124).

The Politics of Water Pollution Control

The Water Pollution Control Amendments of 1961 had been the end result of a 3-year struggle between the Eisenhower administration and the House and Senate Public Works Committees (joined after 1960 by the Kennedy administration).

President Eisenhower had considered the proposed expansion of the construction grant program an unwarranted and possibly counter-productive assumption by the Federal Government of State and local fiscal and administrative responsibilities (125).¹⁷ Congressional committees wanted both to greatly increase sewage treatment plant construction and to include water quality storage as another purpose for construction of Federal reservoirs. They believed these measures were needed to insure adequate supplies of good quality water. The Senate Select Committee on National Water Resources had just stated that the current level of investment in waste treatment work needed to be doubled (126).

However, the 1961 amendments did not satisfy congressional pollution control proponents or organizations such as the Isaak Walton League, the National Wildlife Federation, or the League of Women Voters. Despite the near doubling of Federal investment in water pollution control and despite the fact that sewage treatment plant construction in the early 1960's was at the highest level in history, all indications were that the quality of the Nation's waters was continuing to decline (127).

In 1963, two congressional committees undertook studies of the nature and extent of the Nation's water pollution problems. In the House of Representatives, the Natural Resources and Power Subcommittee of the Committee on Government Operations conducted extensive hearings around the country during the summer of 1963 (128). In the Senate, the new Special Subcommittee on Air and Water Pollution of the Public Works Committee instructed its staff to conduct a thorough study of the Nation's water pollution problems and programs (129). The special subcommittee and its chairman, Senator Muskie, used information collected in this study as the basis for the new legislative proposals in the summer of 1963 (130) that, after lengthy hearings in both Houses of Congress and compromises with the House Public Works Committee, became the Water Quality Act of 1965.

The House and Senate hearings and studies of the early 1960's revealed dissatisfaction with three basic aspects of the Federal water pollution control program. These were:

- (1) The low level of total funding available for sewage treatment plant construction from Federal (and State) sources.
- (2) The bias (inherent in individual construction grant ceilings) against helping communities on the highly urbanized and industrialized waterways that were the most polluted in the Nation and also against the most efficient

¹⁷President Eisenhower asserted that a large-scale, long-term construction grant program would cause local governments to delay essential treatment plant construction while awaiting Federal support.

sizing of treatment plant facilities.

- (3) The alleged inadequacy of Federal enforcement efforts to deal with the national water pollution problem. This inadequacy was variously attributed to such factors as:
 - (a) the Division of Water Supply and Pollution Control's alleged lack of zeal or sufficient authority;
 - (b) lack of State cooperation;
 - (c) lack of a Federal pollution prevention device (the Federal Government could not call an enforcement conference until a serious interstate pollution situation existed; and
 - (d) the inherent cumbersomeness of the enforcement conference procedure (131).

S649, the bill introduced by Senator Muskie in the summer of 1963, purported to deal forthrightly with the problem of Federal enforcement, and also, to some extent, with the problem of providing greater help to metropolitan areas. However the bill deliberately left the issue of how much construction grant money would be needed to be dealt with by subsequent legislation (132).

S649 proposed to create a new agency with status commensurate to its mission (a Federal Water Pollution Control Administration in HEW), to raise construction grant authorizations and individual grant ceilings, and to institute an incentive program to promote comprehensive planning of treatment facilities. Most importantly, it proposed to empower the Secretary of HEW to set both receiving water standards and effluent standards for all U.S. navigable waters as a basis for Federal enforcement.

The battle between advocates and opponents of Federal water quality standards was fought in 2 years of Senate and House committee hearings. Representatives of conservation groups, municipal officials' associations, and the League of Women Voters testified on behalf of Federal standards. Spokesmen for industrial organizations, State health departments, and interstate compact commissions testified against them (133).

Final resolution of the standards issue, as passed in the Water Quality Act of 1965 (134), was a compromise. The act provided a timetable for States to create water quality standards for their interstate receiving waters, which would be enforceable by the Federal Government. If the Secretary of HEW did not find State standards stringent enough, he was authorized to formulate Federal standards, after a conference with the appropriate States, municipalities, industries, and interstate and Federal agencies.

Before the enactment of the water quality standards provision of the Act of 1965, the Federal Government's role was

merely to help States exercise their pollution control responsibilities and to persuade them to agree on solutions to interstate pollution disputes. But this enactment was expected to be a real turning point in that enforcement role in two ways:

- (1) It was expected to enable the Federal Government to make basic water quality policy (in the 14 percent of U.S. waterways defined as interstate waters) and see to it that the States lived up to that policy (135).
- (2) It was expected to provide a quicker, simpler, more direct and effective way to proceed against polluters than the Federal enforcement conference procedure (136).

2. THE SENATE SELECT COMMITTEE ON NATIONAL WATER RESOURCES

Genesis of the Select Committee

At the end of the 1950's, the conflict between the economy-minded Eisenhower administration and the congressional committees responsible for Federal water programs became especially severe. Congressional sponsors of water projects from both parties were already aggrieved by the "restrictiveness" of budget circular A-47, as well as by Presidential vetoes of omnibus rivers and harbors legislation in 1958 (1, 2). Congressional sponsors were angered when the President proposed a policy of "no new starts" in the budgets for fiscal years 1959 and 1960 on grounds that expenditures for continuing public works construction alone would be the highest in history (3). Both the House and Senate Appropriations Committees resolutely ignored this policy and Congress passed a bill providing money for an unusually large number of new starts (4). The President then vetoed the Public Works Appropriations Act for fiscal 1960 (5).

In his 1959 budget message, President Eisenhower also proposed that the Public Health Service's program of grants for sewage treatment plants be one of two Federal grant-in-aid programs to be eliminated and that the Federal tax component of local telephone taxes be relinquished to States to enable them to finance such grants themselves (6). The congressional response was to pass amendments to the Federal Water Pollution Control Act, increasing construction grants from \$50 million to \$90 million a year. The President's veto of this bill also evoked spirited congressional opposition (7).

Shad and Boswell (8) attribute the genesis of the Senate Select Committee on National Water Resources to two factors: (1) congressional dissatisfaction with what was viewed as a "short-sighted" executive branch water development policy, and (2) congressional awareness that, in the preceding decade, numerous official study commissions had recommended changes in Federal water resources programs.

Senate Resolution 48 of the 86th Congress, which created a select committee consisting of representatives of the four Senate committees with major responsibilities in water resources

development (Public Works, Interior and Insular Affairs, Agriculture and Forestry, and Interstate and Foreign Commerce), was approved by the Senate on April 20, 1959. The resolution directed the select committee "to make exhaustive studies of the extent to which water resources activities in the United States are related to the national interest, and the extent and character of water resources activities, both governmental and non-governmental . . . required to provide the quantity and quality of water for use by the population, agriculture, and industry between the present time and 1980, along with suitable provision for related recreational and fish and wildlife values to the end that such studies and the recommendations based thereon may be available to the Senate in considering water resources policies for the future." resources policies for the future."

Hearings were held on Senate Resolution 48 before the Subcommittee on Irrigation and Reclamation of the Senate Committee on Interior and Insular Affairs. At these hearings, all the Senators who spoke and the only non-government witness (a representative of the National Reclamation Association) were strongly in favor of the proposed select committee studies. The witnesses viewed such an effort as necessary to initiate the new water supply developments and technological advances in water conservation that were already needed or would soon be needed to meet western water supply requirements for continued population and economic growth. Some of the witnesses predicted that in the future such developments would be just as urgently needed by other sections of the country (9).

The members of the select committee were appointed on April 24, 1959, by chairmen of the four standing committees from which its membership was drawn. Senator Kerr of Oklahoma, chairman of the Senate Public Works Committee, was elected chairman and Senator Kuchel of California and the minority party was elected vice chairman. Twenty-one months later, on January 30, 1961, the select committee made its report to the Senate.

The Senate select committee's report was based on 23 public hearings at which testimony was invited and received from State and local officials and private citizens in 21 States and the District of Columbia as well as a series of studies and reports recommended by its staff. Of the 32 studies, 28 were prepared wholly or in part by Federal agencies, two by consultants under contract with the committee, one by the States in response to the committee's request for views and comments, and one by a nonprofit foundation, Resources for the Future, Inc., which also performed some of the staff work for the Committee (10).

The Report

The report of the select committee consisted of three parts: (1) the summary report, (2) substantiating materials, and (3) a summary of the activities and studies of the committee.

The summary report envisioned a coming water crisis. It defined national water problems as becoming "more acute and widespread as the demands of our growing population, agriculture and industry press ever nearer to the potential limits of the supply of water that nature provides" (11).

The report listed six major national water problems: (1) the likelihood of very greatly increased demands for water by 1980 and 2000;¹ (2) projected crisis level water shortages in arid regions by 1980 and 2000;² (3) natural water quality; (4) manmade pollution; (5) variability of water supply in areas where average supply was adequate; and (6) floods (12, 13).

The report concluded that solution of these problems was necessary to permit current national and regional economic growth to continue. It called for five major categories of effort:

- (1) Streamflow regulation through reservoir construction and watershed management.
- (2) Water quality improvement through more adequate pollution abatement programs.
- (3) Better use of underground storage.
- (4) Increased efficiency in water use through elimination of wasteful practices, improved sewage treatment, recirculation, increased irrigation efficiency, and substitution of air for water cooling.
- (5) Increased natural water yield through desalting, weather modification, and other means (14).

The report postulated that a minimum cost program for dealing with water supply and pollution abatement problems would require new capital investments by 1980 of \$12 billion for water storage facilities and \$42.2 billion for municipal and industrial sewage treatment works. By the year 2000, an additional \$6 billion for storage and \$39.4 billion for pollution abatement would be required. These sums were based on a "conservative"

¹The report tabulated total water requirements for various purposes in terms of withdrawals, consumptive uses, and in-stream uses on the basis of projections furnished the committee by Federal agencies.

²Severe water shortages were predicted for 1980 in 5 of the 22 regions used in the water supply-demand studies: the South Pacific, Colorado River, Great Basin, upper Rio Grande-Pecos River, and upper Missouri River. By the year 2000, such shortages were predicted for 3 other regions: the upper Arkansas-Red Rivers, western Great Lakes, and western Gulf. The report warned that bold programs for construction of storage reservoirs, desalination, evaporation control, waste water reclamation, and perhaps underground storage or (politically difficult) interbasin transfers would be needed to avoid "placing a ceiling" on the growth of population and economic activity in these regions.

projected rate of growth of the gross national product of 3¾ percent per year. The report stated that the national economy might very well grow at a faster rate, in which case larger amounts of water and even larger capital investments would be needed (15).

In the light of these conclusions and assumptions, the select committee made five general recommendations for implementing the new water policies envisioned in the report. These recommendations were deliberately framed in general terms so as not to infringe the jurisdiction of the regular standing committees of the Senate to propose legislation. However, the committee stated that it hoped appropriate legislation would be introduced (16).

The select committee recommended that the Federal Government:

- (1) Prepare plans for the comprehensive development and management of the water resources of all major river basins, in cooperation with States. This included a provision that the plans give full recognition to stream-flow regulation, outdoor recreation, and fish and wildlife preservation and development. The committee suggested that the executive branch be requested to submit proposals to the Congress by January of 1962, for undertaking and completing such river basin studies in all basins in 1970. Once prepared, the plans should be updated periodically. Future reports on individual projects submitted to Congress for authorization should specify how the project would fit into the comprehensive plan, and the range of alternative purposes that might be served by the resources needed for the recommended project (17).
- (2) Provide funds to help States to participate actively in water resources planning and water development and management activities through a program of matching grants for State comprehensive water resources planning (18). The select committee commented that a program of State planning grants would be needed to implement existing Federal policies favoring intergovernmental water planning. Both Federal legislation, beginning with the Flood Control Act of 1944, and the regional subcommittees of the Interagency Committee on Water Resources had provided for State input in river basin planning efforts, but due to insufficient planning, organization, and financial support, States had been unable to play a significant role in such planning (19).
- (3) Undertake a coordinated scientific research program on ways to increase available water supplies and efficiency

in the use of water required to produce manufactured goods and crops. Budget estimates for the coordinated program were to be submitted by January 1962 (20).

- (4) Prepare biennial assessments of the water supply-demand outlook for each U.S. water resource region. The assessments would be used to inform the Congress and the public of needs for current and prospective public action (21).
- (5) In cooperation with the States, encourage efficiency in water development and use by:
 - (a) delineating flood hazard areas and flood plain regulation,
 - (b) studying emerging water problems of the five western areas where water shortages would be most acute by 1980,
 - (c) studying future needs for major storage reservoirs for river regulation for all purposes, including development of recommendations to reserve future reservoir sites, and
 - (d) holding public hearings in the vicinity of proposed federally sponsored water resources facilities to provide for informed participation in such hearings by State and local agencies, local interest groups, and the general public (22).

Thus, the Senate select committee called on the executive branch to undertake a number of long-sought reforms in planning as well as a new emphasis on research. Recommendation 1 alone would have given the report epochal significance. It expressed senatorial approval of a degree of centralization and coordination of water resources planning and focus on the river basin as the planning unit that had been advocated by virtually all critics of Federal water programs since the administration of Theodore Roosevelt and wanted by all Presidents beginning with Herbert Hoover (23).

Perhaps as important, the report gave the executive branch congressional approval to embark on radically new policy directions. The report certainly did not recommend the diminution of any existing Federal construction agency programs. In fact, it called for expansion of existing agency programs to include new emphases on water quality storage, M and I water supply, recreation, fish and wildlife, and flood plain regulation. However, it did give congressional recognition to the concept that none of the most urgent national water resources problems of the 1960's were the ones that were traditionally—and as a matter of agency jurisdiction—of most concern to the planners of Federal water projects.³

³Navigation, flood control, irrigation, hydropower development, soil conservation, and agricultural water management.

As perceived by the Senate select committee, in January 1961, the Nation's most serious water resources need was to increase scarce or potentially scarce water supplies to supply an ever-increasing demand. It was not primarily a question of water for irrigation (although the possibility of transfers of irrigation water to more highly valued uses was not discussed in any detail in the report). Nor was it primarily a question of water for hydropower development (the great enthusiasm of the New Deal water development proponents). The water supplies that were seen as scarce were supplies for M and I and recreational use. Abundant water supplies were seen as needed to maintain and increase economic growth, while providing the luxuries of water sports and wildlife conservation to an increasingly affluent population. Environmental protection, as such, was not seen as the overriding water issue. However, the committee perceived that pollution abatement was the most important method, in most regions of the Nation, for increasing or even maintaining existing water supplies. Pollution abatement was to be accomplished by sizeable investments in a combination of sewage treatment facilities and impoundments for low-flow augmentation (24). This statement of need, made at a time when Federal and State water quality planning had hardly begun and Federal subsidies to municipal sewage treatment plant construction were limited by law to \$50 million a year, augured even greater policy departures to come.

Implementation of the Report

Planning

The Water Resources Planning Act. The Senate select committee report was concerned with the substance rather than the organization of Federal water resources activities. But it was apparent that organizational changes providing a central authority for all water planning activities would be needed to implement it. However, Congress had rejected numerous previous proposals for such changes. These included proposals for consolidating water resources agencies in one department and creating an independent board or an authority in the Executive Office of the President to review all water planning reports (25). The solution adopted by the Kennedy administration was a more authoritative and ambitious version of the national-level interagency coordinating committee device. Congress had been willing to work with interagency coordinating committees in the 1940's and 1950's and congressional leaders had indicated they would be willing to accept such committees in a more independent and powerful coordinating role (26).

In a July 1961 letter to Congress, President Kennedy requested that the planning recommendations of the select committee be implemented. He transmitted a draft statute, the proposed Water Resources Planning Act of 1961 (27).

The President's bill proposed establishing a Water Resources Council composed of the Secretaries of Agriculture, the Army, the Interior, and Health, Education, and Welfare. The Water Resources Council would have authority to make the biennial nationwide water supply-demand studies recommended by the select committee. It would also be authorized to establish uniform standards for evaluation and formulation of water projects by all Federal planners; review plans from river basin commissions; and most important, study and recommend changes in the entire Federal water resources program.

The bill proposed a method of establishing river basin planning commissions to represent all Federal agencies, State governments, and interstate or international commissions having an interest in the basin. It also included the program of grants to States for comprehensive water resources planning recommended by the Senate select committee (at an annual rate of \$5 million a year). The bill also specified that the institutions it created would not replace or supersede existing authorities of Federal water resources agencies or infringe on jurisdictions of international water resources agencies.

The proposed legislation was the subject of congressional negotiations for 4 years. It was finally passed with minor changes as the Water Resources Planning Act in July 1965 (28). These changes were principally intended to permit States to have an equal role in the establishment and functioning of river basin commissions and to assure that the Act would not change existing Federal-State and interstate relationships concerning water rights and water resources development responsibilities, particularly in the Colorado and Columbia basins (29).⁴ The Chairman of the Federal Power Commission was also made a member of the Water Resources Council.

Senate Document 97. Shortly after submission of the planning bill to Congress in October 1961, the President made a request of the four Secretaries who would comprise the Water Resources Council. He asked them to review current policies, standards, and procedures for formulation, review, and evaluation of water projects and to develop new ones for uniform adoption by all Federal agencies. This was done by an

⁴The most important of the changes was section 3(d) of the Act which provided that neither the council nor the river basin commissions could "study, plan or recommend the transfer of waters between areas under the jurisdiction of more than one river basin commission or entity performing the function of a river basin commission."

interdepartmental staff committee and submitted to the President by the four Secretaries on May 15, 1962 (30).

President Kennedy accepted this report the same day he received it. Also on the same day, the Director of the Bureau of the Budget rescinded the unpopular circular A-47.⁵ The new interagency water standards were published as Senate Document 97 by the chairman of the Senate Committee on Interior and Insular Affairs.

Senate Document 97 stated that the objectives of water and related land resources planning were: economic development (to be provided for by selection from a complete list of types of water project), preservation of natural resources, and well-being of people—the overriding determinant (31).

The document did not attempt to establish priorities among planning purposes. It did make a point, however, that Federal planners must now consider recreation and water quality on a par with the established Federal concerns of navigation, flood control, irrigation, hydropower, watershed protection, fish and wildlife, and the more recently recognized purpose—municipal water supply. It also stated that all planning purposes must be considered without restrictions based on reimbursement or cost sharing policies. Senate Document 97 did not attempt, however, the troublesome business of devising uniform interagency policies concerning allocation of costs between the Federal Government and water project beneficiaries. Instead, it stated that such policies would be established subsequently.

Senate Document 97 directed that all viewpoints—national, regional, State, and local—should be considered but that significant departures from the national viewpoint should be identified as such in the planning reports. It directed that multiple-purpose plans be preferred to single-purpose plans and individual projects be formulated in the light of river basin plans. Interagency and intergovernmental coordination was to be carried out from the earliest steps in the planning process to the final review.

The report directed that planning reports consider all tangible and intangible effects (although the benefit-cost ratio was to be based on tangible effects only). Planning reports were required to take into account the expected expansion of the economy and the problems of depressed areas and underemployment. Where warranted by intangible benefits and costs or other policy concerns, planning reports were also required to include comparisons of the effects of alternative projects and combinations of projects.

⁵For a brief description of A-47 and the controversy surrounding it, see the first volume of this history, pp. 37-38.

National secondary benefits (but not merely local or regional secondary benefits) were to be eligible for inclusion in the benefit-cost ratio. Planning reports were also required to include an analysis of present and projected economic conditions in the area (with and without the project) and how resource development in the region would affect national economic activity and development in other regions.

The report directed that the period of analysis be the useful life of the project, not to exceed 100 years (thus eliminating the 50-year limitation of circular A-47 that was so disliked by Congress). It directed that the discount rate be based on the average rate of outstanding U.S. securities, which, on original issue, had terms of 15 years or more. (In 1962, this was only 3¼ percent.) Price levels to be used in planning were to be based on the exchange value expected when costs would be incurred and benefits would accrue.

When Senate Document 97 was issued, Congressmen, Federal agency representatives, and disinterested observers of Federal water policy predicted that it would facilitate the national, fully comprehensive, river basin planning effort recommended by the Senate select committee. They also predicted that it would encourage Federal investment in large, multiple-purpose water projects (32).

This prediction was reinforced in June of 1964 when the four Secretaries of the ad hoc Council issued standards setting a monetary value for primary recreation benefits so that they could be used in benefit-cost analysis on the same basis as other project benefits (33). The following year, the Federal Water Project Recreation Act provided legislative recognition of recreation benefits in the economic justification of Federal water projects as well as a formula for allocating the costs of recreation benefits (34).

Comprehensive River Basin Planning. In June 1962, the Director of the Bureau of the Budget requested the ad hoc Council to carry out the Senate select committee's recommendation 1. Recommendation 1 was that the executive branch submit plans to the Congress, in January 1962, for undertaking and completing comprehensive water development and management studies in all basins by 1970.

The interdepartmental staff committee, thereupon, undertook to coordinate the water planning programs of the four Departments. In November 1962, the ad hoc Water Resources Council submitted a tentative schedule of 150 proposed comprehensive river basin studies for the entire country to be accomplished on an estimated combined budget of \$400 million. The studies were to consist of 18 type I "framework" plans for the

major U.S. water resources regions (apart from Alaska) as well as more detailed type II (basin level) plans and type III (project level) plans that could be used for authorization of projects (35).

The ad hoc Council's original estimate of total cost for nationwide comprehensive planning was questioned by the chairman of the Senate Subcommittee on Public Works Appropriations during consideration of the 1964 budget (36). The Kennedy administration subsequently made plans for cutting the budget in fiscal years 1965-67 (37). As a result, in December 1963, the ad hoc Council submitted a less ambitious program (with an estimated cost of \$88 million) to be completed by 1970. This program consisted of the 18 framework plans and 16 basin level studies that were already begun (38).

In actuality, as a result of budgetary constraints, only the original 16 type II studies and four of the framework plans were begun before the establishment of the statutory Water Resources Council in fiscal 1966 (39).

The most important work of the interdepartmental staff committee of the ad hoc Council was the preparation it made for the work of the statutory council in the second half of the decade.

This included the following actions:

- (1) Coordinating the basin planning budgets of the four major construction agencies (40).
- (2) Selecting an institutional mechanism to conduct comprehensive river basin plans pending the establishment of the river basin commissions proposed in the water resources planning bill. The "coordinating committee" device selected was similar to the interagency coordinating committees chaired by the Corps of Engineers in their Delaware and Potomac planning efforts. However, in areas where regional subcommittees of the Interagency Committee on Water Resources (ICWR) were operating, the task was given to the existing interagency committee (41).⁶
- (3) Developing guidelines to be used by the four Departments in making river basin surveys (42).
- (4) Initiating a program of regional economic base studies for use in framework planning. The ad hoc Council assigned responsibility for this program to the Office of Business Economics in the Department of Commerce and the Economic Research Service of the Department of Agriculture (43).

Research

The Senate select committee's recommendation 3 called upon the Federal Government to undertake a strengthened, coordi-

⁶The ICWR subcommittees participating included the Missouri Basin Interagency Committee, Columbia Basin Interagency Committee, and others.

nated, multidisciplinary research program into means of augmenting water supplies and making more efficient use of water. It also called upon the executive branch to review existing Federal water research programs and to develop a coordinated program that could be submitted to Congress along with budget estimates.

President Kennedy responded in early 1961 by directing the National Academy of Sciences to undertake a broadly based study and evaluation of the present state of research into conservation and development of natural resources generally. At the same time, he directed the Federal Council on Science and Technology to review ongoing Federal research activities in the field of natural resources and to determine ways to strengthen the Federal research effort in natural resources (44).

In addition, the Senate Committee on Interior and Insular Affairs undertook its own study of the Federal water research program. Chairman Anderson sent out two requests for information on water resources research activities, one to Federal agencies with water research programs, the second to a sampling of universities, private foundations, and firms that did water research. The letter to Federal agencies requested that they classify their water research activities in accordance with the specific categories⁷ set forth in the Senate select committee report and invited the agencies to comment on the advisability of a coordinated program of Federal water research (45).

Committee Print on Water Resources Research. The Senate committee published the replies it received to both requests together with an analysis prepared by Theodore Schad of the Library of Congress. The analysis of the replies drew two general conclusions:

- (1) Better coordination of Federal agency water research was essential because of substantial increases in water research activities projected for the next few years and the diversity of Federal research programs.
- (2) Federal support should be provided for independent water research centers at universities to do the basic research

⁷These categories were: (a) Reducing evaporation from the surface of reservoirs. (b) Eliminating water-loving vegetation (phreatophytes) from edges of reservoirs and watercourses. (c) Changing or modifying forest and vegetative cover on watersheds to reduce evapotranspiration. (d) Reducing seepage losses in irrigation canals and other water distribution systems, and other wasteful irrigation practices. (e) Reducing dilution requirements for pollution abatement by development of improved methods for treatment or control of waste materials discharged into water. (f) Waste water salvage. (g) Reuse, recycling, and elimination of wasteful water use by industry. (h) Desalting of saline or brackish water. (i) Weather modification. (j) More accurate quantitative forecasting of meteorologic events. (k) Application of nuclear products in research. (l) Improved use and control of ground water.

needed to prepare the way for future changes in water technology. Although universities were already conducting a great deal of water research, too little of this was basic research because it was funded by industries and government agencies interested only in specific practical applications (46).

National Academy of Science Report. In December 1962, the National Academy of Sciences (NAS) published *Water Resources*, Dr. Abel Wolman's special report to its Committee on Natural Resources. The NAS report focused on the need for research in support of planning rather than basic research in support of applied technological research.

Like the report of the Senate select committee, the NAS report saw the Nation's water problem as an impasse between ever expanding national demands on water resources and increasing water shortages in some regions together with shortages of good quality water due to pollution in others (47). The solution that it proposed was improving methods of water resources planning so that planning could be based on a greater range of technological and institutional alternatives. The report asserted that the development of such improved methods could only be accomplished by a more ambitious research program in the physical sciences and especially in the social sciences. The existing Federal research program was seen as mainly "orthodox data collection and partial interpretation" (48). Wolman concluded that the following areas of research required most urgent consideration: interdisciplinary training of personnel, ground-water supplies, systems for development of water resources, evaporation suppression and transpiration control, water-purification methods, and forecasting the effects of pollution damage (49).

Wolman also stated that the most urgent need of all was the establishment of Government and university programs to enlist and train new people in virtually all disciplines relating to water resources (50).

Federal Council for Science and Technology Report. In February 1963, President Kennedy sent the Senate a report on the water research activities of the executive branch of the Government, prepared by a task group on coordinated water research of the Federal Council for Science and Technology. The President requested that the task group's report be considered in connection with fiscal 1964 budget requests for increased support of water resources research and proposals for new legislation to stimulate such research (51).

The task group's report, like the NAS report, saw scientific manpower shortages as the most urgent problem to be solved in

undertaking expanded Federal research programs, and recommended both increased agency reliance on extramural research and the establishment of independent water research centers at universities. In addition, the task group recommended legislation giving one Federal agency responsibility for administering Federal support to the water research centers (52).

The report also recommended that the Office of Science and Technology be given responsibility for encouraging interagency planning and coordination through an interagency committee on water resources research (53).

The task group considered that the most obvious program deficiencies in Federal water resources research were virtually the same as those identified by the NAS report: intramural and extramural education and training, ground-water research, socioeconomic research, and water quality research (54).

The Water Resources Research Act. Several of the recommendations of the three reports discussed above, supported by the testimony of Government and university witnesses at Senate and House committee hearings, were incorporated in the Water Resources Research Act of 1964 (55).

Title I of this statute provided for the establishment of a water resources research institute in every State and Puerto Rico, at a land-grant college or other college or university designated by the State legislature. These institutes were to be centers where basic research and studies of practical water problems in the State or area could be undertaken and students could be trained for careers in the hydrosociences while aiding in useful research projects. Each institute was authorized to be funded at an annual rate of \$100,000 after 3 years. Title I further authorized a program of matching grants to the institutes to finance specific research projects at a rate of \$1 million for all 51 institutes in 1965, rising to \$5 million in 1969 and subsequent years.

The legislative model for title I was the Hatch Act of 1887, which had brought about the establishment of agricultural experiment stations at land-grant colleges and State universities. Senator Anderson, in introducing the original bill, explained that the water resources research institutes were expected to play as influential a role in the development of scientific water management as the agricultural experiment stations had in the development of scientific agriculture and that, like the experiment stations, they would serve a State and local clientele (56).

Title II gave the Secretary of the Interior responsibility for approving, assisting, and coordinating the work of the institutes. It also authorized annual appropriations of \$1 million

to the Secretary, to make grants or contracts with agencies or institutions other than the State water resources institutes. This grant program was for research into aspects of water problems related to the mission of the Department of the Interior.⁸ The act also directed the Secretary to obtain the continuing advice and cooperation of Federal, State, and local government agencies, private individuals, and organizations. It further directed him to make information available on all projects completed, in progress, or planned, under the provisions of the act.

Title III directed the President to clarify agency responsibilities for Federal water resources research and to provide for interagency coordination of such research, including the Interior Department research authorized by the act. It also directed the President to establish a center for cataloging current and projected scientific research in all fields of water resources.

Committee on Water Resources Research. The Water Resources Research Act was passed on July 17, 1964 (57). In October 1964, President Johnson designated the Office of Science and Technology (OST) as the lead agency to assist him with the task of coordinating Federal water research.

OST, in turn, assigned this task to the interagency Committee on Water Resources Research (COWRR),⁹ which it had formed in September 1963, in response to the recommendation of the coordinated water research task group (58). At the same time, the President directed the Science Information Exchange of the Smithsonian Institution to prepare the catalog of water research called for in the act (59).¹⁰

COWRR had, in its first year, already reviewed proposed Federal agency programs and budgets for fiscal 1965, classified all agency projects by category and subcategory, and made arrangements for coordinating related projects and eliminating areas of unwarranted duplication. The committee had also endorsed or withheld endorsement of proposed program increases for fiscal 1965 on the basis of research priorities

⁸The 1966 Amendment to the Water Resources Research Act (80 Stat. 129, 42 USC 1961) was to substantially increase the amounts that could be made available under title II of the act. It authorized appropriations of \$5 million in 1967, rising to \$10 million in 1972-76.

⁹COWRR was chaired by OST and included representatives of Departments of Agriculture, Commerce, Defense, HEW, and Interior, the Atomic Energy Commission, National Science Foundation, and TVA. Representatives from the Bureau of the Budget and Council of Economic Advisors were official observers.

¹⁰The Water Resources Research Catalog, first published in February 1965, became an annual publication of the Office of Water Resources Research of the Department of the Interior. It was compiled by the Science Information Exchange with the cooperation of COWRR members, acting as representatives of their respective agencies.

identified by the NAS report and the Federal Council's task group report (60). In its second year, COWRR worked on the preparation of an expanded Federal water research budget for fiscal 1966, and also began work on a long-range plan for Federal water research in the next 10 years (61).

The two largest increases in the proposed 1966 budget were not brought about by COWRR. They were both for the Department of Interior: (1) for the desalination research program of the Office of Saline Water and (2) for the entirely new agency that was charged with administering the grants for university water research. However, even excluding these two programs, the coordinated budget that COWRR proposed for fiscal 1966 was 18 percent higher than funds available for the Federal water research program in fiscal 1964. Moreover, COWRR pointed out that the total Federal water research program proposed for 1966 had risen to within 6 percent of the \$1.6 billion proposed for water resources development (62).

Meanwhile, in December 1964, the Secretary of Interior created a new agency, the Office of Water Resources Research, to carry out the responsibilities of the Department under the Water Resources Research Act. Funds were provided in the 1965 budget for initial allotments to the 51 State and territorial water resources institutes (63).

Flow Regulation for Quality Control

The report of the Senate select committee had concluded that "streamflow regulation through reservoir construction and watershed management" was the first of five major categories of effort needed to meet long-range demands for water or water-related activities "so as not to inhibit national or regional economic growth" (64). In so stating, the committee appeared to be treading a well-worn path. New Deal and Truman era proponents of river basin development had also advocated nationwide programs of reservoir construction as necessary for future prosperity. The factor that was original in the select committee's advocacy was that the principal benefit that the reservoirs were expected to confer was neither cheap electricity, nor better land use, nor protection from catastrophe, but pollution control.¹¹

The select committee's belief that impoundments for low flow augmentation would be needed to maintain water quality for fish life and outdoor recreation, "even when advanced practices for waste treatment are applied" was to influence many events in the early 1960's (65). These included such already discussed

¹¹Except in the 5 western regions identified as having imminent water supply shortages.

matters as the 1961 amendments to the Water Pollution Control Act, which authorized the Secretary of HEW to make studies of the need for water quality storage at all Corps of Engineers and Bureau of Reclamation reservoirs; the highly controversial planning proposals of the Corps of Engineers for the Potomac basin; and the increased participation of the PHS in interagency river basin planning efforts.

Desalination

Another of the five major categories in which the select committee had suggested action to meet prospective long-range water demands had been increasing natural water yields through such means as desalting and weather modification (66).

The Office of Saline Water (OSW) of the Department of the Interior had, since 1952, operated a modest research program to develop a low-cost means of producing good quality water from sea or other saline water (67). In 1955, funds authorized for the program had been increased to \$10 million to be spent over a period extending to 1963 (68). In 1958, provision was made to construct and operate five demonstration plants with another \$10 million authorized over a 7-year period (69).

In 1961, in one of the earliest congressional responses to the concerns of the select committee, the Saline Water Conversion Act was amended (70, 71). The 1961 amendments greatly expanded basic research in the desalination research and development program. They authorized appropriations of \$75 million to be spent over a 5-year period.

In addition to its congressional backing, the saline water program had the strong support of President Kennedy, who requested that a special panel of his Science Advisory Committee work with OSW to assure the most vigorous research and development program possible (72).

In 1965, progress in basic research caused OSW to change its emphasis to the engineering of basic hardware (73). Congress provided for this change of emphasis by raising appropriations authorizations to \$185 million for the 5-year period, 1961-67 (74).

3. THE WARS OVER WATER

The Colorado

The River and the Controversy

The Colorado River system is the largest in the United States that flows mainly through arid lands requiring irrigation for regular crop growth. The 1,440-mile-long river drains a basin that extends into seven States, including almost all of Arizona and half of Utah and Colorado, as well as a part of Mexico.¹ Although the basin includes almost 7 percent of the national land area, it contained only a little more than 1 percent of the national population in the early 1960's.² However, both the population and the economy were growing very rapidly, particularly in the urban centers of Phoenix and Tucson (1).

Although the flow of the Colorado is very small in proportion to its length,³ the river supported the largest consumptive use of any major American river and exported more water outside the river basin than any other U.S. river. The largest interbasin diversion was for irrigation and M and I supplies for southern California. Substantial amounts were also supplied to the Denver area and the Salt Lake basin (2).

The Colorado was also one of the most developed rivers in the Nation. However, it still contained stretches of open river, the most celebrated of which was the 342-mile Colorado River Gorge between Glen Canyon Dam and the head of Lake Mead (the reservoir behind Hoover Dam). Almost 150 miles of this gorge were within the boundaries of Grand Canyon National Park

¹The Colorado basin was divided by the Colorado River Compact and the Boulder Canyon Project Act into the upper basin and the lower basin. The four upper basin States are Colorado, New Mexico, Utah, and Wyoming. The three lower basin States are Arizona, California, and Nevada.

²The service area of Colorado River water which included the great and growing Los Angeles-San Diego megalopolis presented quite a different picture.

³The estimated average annual flow of the Colorado in the 1950's and 1960's was only about 15 million acre-feet (maf). Records indicate it had been somewhat larger earlier in the century. By comparison, the average annual flow of the Columbia (which drains a basin of the same size as the Colorado's) is 180 maf and that of the Mississippi is 440 maf.

and National Monument. The rest, although it contained spectacular scenery and unique geologic and biologic phenomena, was accessible to very few visitors.

The Colorado was not only subject to more physical controls than most American rivers, it was also subject to more legal controls. Indeed, although there was some uncertainty concerning proportionate entitlement (that was partially resolved by the 1963 Supreme Court decision), the entire annual flow of the main river was legally allocated between the seven States and Mexico. Within each State, virtually all the surface waters of the basin were appropriated by government agencies, water users' organizations, and individuals, according to State law.⁴

However, neither the so-called law of the river nor the law of prior appropriation conferred any right to water quality. Although the Colorado had probably always been a highly saline river, its salinity had recently increased drastically in the lower basin, as a result of domestic, industrial, and agricultural use in the upper basin. The salt loading of the river, within the lower basin, became greater the further it flowed.

The U.S.-Mexican treaty of 1944 had guaranteed Mexico a yearly flow of 1.5 maf of water from the Colorado. But in the early 1960's, the salinity of the flow of the Colorado into Mexico had severely reduced its usefulness for irrigation. In 1961, this led the Mexican Government to express concern about the deteriorated quality of the water. The main cause of the extra salinity of the water delivered to Mexico was the pumping of saline groundwater from the Wellton-Mohawk reclamation project into the Gila River near the Mexican border. In 1965, the completion of a drainage bypass canal gave Mexican users the option of accepting or rejecting the degraded water. In the same year, President Johnson, meeting with the President of Mexico, formally committed the United States to pay for a special 75-mile canal to carry the Wellton-Mohawk drainage water directly to the Gulf of California (3).

The Colorado River Compact. The special body of federally enforceable law concerning the Colorado had begun with the Colorado River Compact, which had been drawn up in 1922 but did not become effective until 1929. The compact divided what was then erroneously estimated to be only a part of the annual flow of the Colorado into equal shares of 7.5 maf, for consumptive use in the lower and upper basin States. It also

⁴State law in the upper and lower Colorado basins was and is based on the doctrine of prior appropriation, although in California both the appropriation and the riparian rights systems operate. The basic relevant rules of the appropriation doctrine are: "first in time is first in right," the beneficial user of water may consume the water he removes from the stream, and use is not limited to riparian land.

authorized lower basin States to appropriate an additional 1 maf a year after first claims to 15 maf were satisfied.

The compact had originated as a result of the growth of political backing in California for the Bureau of Reclamation's construction of a very large storage dam at Boulder Canyon (Hoover Dam). It was drawn up to allay the fears of the more slowly developing upper basin States that California water users would be able to acquire binding prior claims to river water supplies that would later be needed in the upper basin States.

However, the compact did not allocate water among the individual States within the upper and lower basins. For this reason, Arizona (also apprehensive that California would preempt its opportunities for future water development) refused to ratify it until 1944. In 1925, the 6 ratifying States modified the requirement for 7-State approval to provide that the compact would become effective on the approval of 6 States and the consent of the United States (4).

This consent was given by the Boulder Canyon Project Act of 1928 (5). The Act, however, contained a provision that the dam would be built only if California would agree to limit its annual consumptive use of river water to 4.4 maf of the 7.5 maf allocated to the lower basin, plus no more than half of any surplus waters unapportioned by the compact. California met this requirement by passing the California Limitation Act on March 4, 1929.

In the 1940's, Arizona reversed its position and the Bureau of Reclamation began to prepare plans for the central Arizona project (CAP), a large-scale irrigation development wanted by Arizona interests. Bills to authorize the project were introduced in 1950 and 1951, but were held up by the House Interior Committee because of uncertainty that Arizona had legal title to enough water to supply the project (6).

Arizona v. California et al. (7)

In 1952, after California public agencies had diverted almost 1 maf in excess of the 4.4 maf annual limitation, Arizona sued California in the U.S. Supreme Court to restrict California's legal title to the 4.4 maf limitation. After years of litigation, the Supreme Court handed down a decision in 1963, which supported Arizona's major claims concerning the major issues involved.

The first issue concerned the allocation of the tributaries of the lower basin. The Court did not attempt to interpret the compact, but ruled that Congress through the Boulder Canyon Project Act, had allocated the waters of the main stream of the Colorado only (8). This meant that Arizona was entitled to all

the waters of the tributaries within the State, which yielded a dependable annual average flow of 2 maf. Moreover, this entitlement did not diminish her entitlement to 2.8 maf from the main stream.

The second major issue decided by the Supreme Court was how shortages were to be allocated when the mainstream flow in the lower basin should become insufficient to sustain 7.5 maf of annual consumptive use. The only reason why an annual flow of 7.5 maf was still passing Lee's Ferry consistently by 1963 was that the upper basin States had not yet developed the means to make use of their allotment. However, it was known that this situation would not long continue, since Glen Canyon Dam in Arizona, just below the Utah border, was nearing completion and the filling of its reservoir, Lake Powell,⁵ had begun.

This issue was also decided by the Supreme Court's interpretation of the Boulder Canyon Project Act. The Court ruled that the project act had given the Secretary of Interior authority to divide the waters of the river in the lower basin. The Secretary had exercised this authority by executing valid contracts with each of the three States for delivery of a specific amount of the 7.5 maf a year,⁶ assumed to be physically available in the stream. In the event of shortages, it followed, therefore, that the Secretary had discretionary power to allocate the shortages, after first providing for the satisfaction of "present perfected rights" (9). (Present perfected rights were all water rights within the three States that had attached to specific quantities of water before the Boulder Canyon Project Act took effect on June 25, 1929.) The Court pointed out that, if Congress was not satisfied with this interpretation of the intention of the Project Act, Congress could enact its own formula for apportioning the shortages (10).

A third important aspect of the Supreme Court's decision concerned water rights for Federal reservations. The decision further developed the rule that Federal reserved lands—in this case Indian reservations, national forests, recreation, and wildlife areas—were entitled to the amount of water necessary to accomplish the purposes for which they were created. The Court ruled

⁵The largest reservoir in the Bureau of Reclamation's Colorado River storage project, authorized in 1956 to meet upper basin needs.

⁶To California—4.4 maf of annual consumptive use, plus one-half of the surplus, subject to physical availability; To Arizona—2.8 maf of annual consumptive use, plus one-half of the surplus, subject to physical availability, less 4 percent of the surplus if Nevada should in the future contract with the Secretary of the Interior for such water; To Nevada—300,000 acre feet a year, plus 4 percent of the surplus if Nevada should contract with the Secretary for such water, subject to physical availability. ("Surplus" was defined to mean water available in the lower basin to supply annual consumptive uses in excess of 7.5 maf.)

that the amounts of water allocated to Federal reservations (assuming they were withdrawn from entry prior to June 25, 1929) must also be considered present perfected rights to be fully satisfied before shortages could be allocated. Furthermore, these amounts must be calculated in terms of potential rather than actual water developments (11).

The day following announcement of the Supreme Court's opinion in *Arizona v. California*, bills to authorize the CAP were again introduced in Congress. Arizona now had enough water for the project, which was designed to divert about 1.2 maf annually to the Phoenix and Tucson areas of Arizona. The project would deliver 758,000 acre feet of supplemental water for irrigation⁷ and 312,000 acre feet for M and I use. It would thus partially reduce the area's existing ground-water overdraft of about 2.2 maf annually (12).

The Pacific Southwest Water Plan

The probability that the CAP would soon be built and that Utah, Nevada, and New Mexico would also soon obtain authorization for additional storage projects on the river brought into focus the prediction of imminent water shortages. This was particularly true in southern California, and most particularly in the large and growing Los Angeles and San Diego metropolitan area. The southern California megalopolis had just lost legal title to about 1 maf a year, although the loss would not be felt until the CAP was built (13).⁸

Two months after the decision of *Arizona v. California*, Secretary of the Interior Udall published the Pacific Southwest Water Plan (PSWP). This was transmitted to the Governors of the seven Colorado basin States and to five Federal agencies for their official review. Many changes were proposed by the reviewers, particularly the California reviewers, and many of these were incorporated into the revised plan submitted to the President in February 1964 (14).

The revised PSWP proposed the largest regional development ever undertaken for any of the Nation's river basins. It proposed this development for a region, consisting of the lower Colorado River basin and southern California, which was the driest, the fastest growing, and (for any comparable geographic area) the

⁷The 6 maf of water a year that was already being used for irrigation in Arizona at this time accounted for 90 percent of the water consumed each year other than by range and forest lands. Of this, 2.5 maf was used on high-value intensive crops (cotton, vegetables, and fruits) while 3.5 maf was used on low-value feed crops and forage. Both cotton and feed grains were in surplus.

⁸The Metropolitan Water District of Southern California, the city of Los Angeles, and the city and county of San Diego were junior appropriators. According to State law, they were not entitled to any water from the Colorado until four prior appropriator-irrigation districts received their entitlement of 3.85 maf.

most prosperous in the United States. The plan was designed to augment water supplies in the region in order to preserve the existing agricultural and industrial economy and the demands of predicted increases in urban and industrial growth.

The PSWP recommended the undertaking of 17 specific projects and programs, 13 for immediate authorization. These included the CAP, two large hydropower projects at Bridge and Marble Canyons in the Colorado River Gorge, an enlargement of the California State aqueduct to carry water from northern to southern California, smaller water supply projects (including Indian irrigation projects) and smaller hydroelectric developments. The plan also included fish, wildlife, and recreation developments, as well as programs for phreatophyte control and groundwater recovery. In addition, programs for waste water renovation and desalination were to be undertaken by State and local agencies with Federal assistance (15).

The key feature of the plan was a regional development fund or basin account which, like basin accounts for the upper Colorado, Central Valley, of California, and Missouri Valley, was proposed to make the entire regional development self-liquidating.⁹ The fund would receive congressional appropriations for reimbursable elements of the plan¹⁰ and revenues from sale of water and power throughout the region—including revenues from the Hoover Dam and the Parker-Davis projects (after the older projects had paid out their own costs and obligations, in 1987 and 2005, respectively). Hydropower revenues that would be received from the proposed Bridge Canyon and Marble Canyon Dams, the “cash registers” of the plan, were expected to pay a major part of the costs of implementing the plan.

In addition to paying project costs, the fund could be used to assure the lower basin States that, when it became necessary to import water into the basin, costs to water users would not increase. Furthermore, the fund would also be used to assure the watersheds of origin of the imported water (in northern California) that costs to water users in their own areas would not be increased by export of water to the Colorado (16).

The Lower Colorado River Basin Project Bill

The Pacific Southwest Water Plan was not adopted by President Johnson, in part because it had not fully resolved

⁹Other reclamation projects were expected to be self-liquidating on a project-by-project basis apart from nonreimbursable elements and the interest subsidy to irrigation. (See the first volume of this history—pp. 20-21, and 35—for a discussion of the reclamation program’s repayment policy.)

¹⁰Appropriations for fish and wildlife, recreation, Indian development, and flood control were nonreimbursable. But these were comparatively low-cost aspects of the plan.

controversies between Arizona and California. Instead, the President called upon representatives of the two States to meet with representatives of the Department of Interior and the Bureau of the Budget "to formulate an approach that could be supported by both States." The resulting negotiations produced a compromise known as the lower Colorado River basin project (LCRBP) because it omitted the California features of the PSWP. (The enlargement of the State aqueduct was already authorized for construction in the California State water project (17).) In 1965, a group of bills containing similar versions of the LCRBP were introduced in Congress (18).

HR 4671 and similar bills constituted a reduced version of the PSWP that still required a financial outlay of about \$1.3 billion (19). The bills included the most important elements of that plan, namely the CAP, the Bridge and Marble Canyon projects, the development fund, and the southern Nevada water supply project. The Dixie project in Utah and the Indian irrigation projects that were part of the PSWP were already authorized by other legislation (20).

In addition, HR 4671 contained two major provisions, not in the PSWP, that had been added at the behest of California representatives:

- (1) All existing uses in California up to 4.4 maf a year, as well as all existing uses in Arizona and Nevada, would have prior rights in time of shortage over the CAP (21).
- (2) The Secretary of the Interior would investigate possible sources of water for importation into the Colorado River basin, most likely from the Pacific Northwest and the Columbia basins (22).

After the first set of House committee hearings on HR 4671 in 1965, several changes were made to allay the remaining apprehensions of representatives of the upper basin States that CAP would drain off the water wanted for future developments in the upper basin. These included adding five reclamation projects in Colorado and the Hooker project (to serve New Mexico) together with the water rights needed to use it (23).

Consequently, at the beginning of 1966, representatives of all seven States of the lower and upper basins supported the renamed Colorado River basin project (24). However, it was obvious that this compromise measure was generating as much controversy as it had resolved.

Representatives of Arizona defended the CAP with feelings of outraged legitimacy that this long-awaited project should still be in question. They pointed out that during the years in which their own surface water entitlement was being litigated and in which Arizona was compelled to deplete its ground water resources, they had faithfully supported Federal water

developments in the upper basin and elsewhere in the West. They felt that their own claim to use enough of their own water to keep an existing agricultural economy from failing and to allow a prosperity bringing urban growth to continue was simple equity (25).

Upper basin and California representatives were enthusiastic about proposals to study plans for interbasin transfers to supplement the Colorado's water. They viewed such transfers as the only way to insure that the river would be able to supply enough water to meet the reasonable and foreseeable demands that would be made on it (26).

California officials, in particular, viewed large water importation works as the great planning achievement of the future. At the 1965 House committee hearings, they pointed with pride to their own State water project and drew attention to the failure of New York City in the humid East to provide adequately for the water shortages it was then suffering (27).

But two major sources of opposition still faced the lower Colorado river basin project bill at the end of 1965. The first was the well-organized opposition of conservation groups to the building of dams near Grand Canyon. This had its greatest political impact as a call to preserve the Nation's natural heritage (28). However since Bridge and Marble Canyon Dams had no irrigation features, but were wanted primarily to provide hydropower revenues to finance irrigation development, controversy over the dams also brought into focus the question of economic efficiency of hydropower. Critics compared hydropower to other sources of power and questioned whether it was desirable to build hydro dams in order to fund irrigation projects. The controversy over the dams also aroused interest in the question of the economic and social justifications for any Federal subsidy to irrigation (29).

The second source of opposition was the fear of Congressmen from the Northwest States that Interior Department water importation studies would be used to justify the construction of pipelines to drain away Columbia River water that their own States might need in the future (30).

The Great Eastern Drought and Its Consequences, 1962-66

In 1959, western Senators who proposed the studies of the Senate select committee as a means to achieve the new water supply developments needed by their region predicted that such developments would soon be wanted just as urgently in the humid East. They did not have long to wait to see their predictions come true.

Between the dry October of 1961 and the autumn rains of 1966, there were 5 years of exceptionally light rainfall throughout the East—but especially in New England, New York, New Jersey, Pennsylvania, Delaware, much of Maryland, northern Virginia, and the Great Lakes States. This dry spell occurred in the most highly urbanized and populated section of the country.

The first year of noticeable water shortage in most of the area was 1963. By 1965, the Great Lakes (whose levels had been falling below previous normals since 1955) were at the lowest since they were first measured 104 years previously. Some representatives of Great Lakes States began proposing water importation from Canada. By 1965, New York City and northern New Jersey also had frighteningly low reserves in their public water supplies and had adopted water-saving plans. The New York City metropolitan area plans involved campaigns to detect and repair leaks in mains and pipes and to limit uses for air conditioning, car washing, and lawn watering. Still more frightening was the situation in Philadelphia, whose water supply intakes were being threatened by salt water intrusion.

The worst year for Washington, D.C., Baltimore, Md., and York, Pa., was 1966. Baltimore had only 100 days' supply left in its reservoirs when it began drawing on the Susquehanna River for its public water supplies according to plan.

The drought focused public attention on a number of controversies over short water supplies (which are discussed below) but it also focused an unprecedented amount of public attention on water pollution problems in the most highly urbanized and industrialized section of the country. Water pollution problems that were intensified by the drought were: salt water intrusion into estuaries for long distances, low dissolved oxygen content in estuaries and streams, and increased fertilization, especially in lakes (31).

The Everglades

In Florida, a man-made dry spell coincided with nature's. Following a 1948 hurricane that struck Lake Okeechobee, massive canals had been built by the Corps of Engineers to prevent floods and reclaim swampland for agriculture. The lake was diked along the southern side, cutting off the overflow into the Everglades, and leading to salt water intrusion at Dade City, Miami, and other coastal cities. When drought conditions struck Florida in 1962, Everglades National Park was no longer fed by the shallow Shark River. The park began to dry up and its wildlife began a drastic decline. The National Park Service asked the State flood control district, which was responsible for operating the flood protection works, to release more water. This

request was refused. In 1965, the House and Senate Appropriations Committees permitted Secretary of the Interior Udall to divert \$287,000 from other purposes to pump water from Lake Okeechobee through the dried-up Shark River slough into the park.

In 1966, after the lowest rainfall situation ended, the State adopted some measures to make more water available to the Everglades. But the National Park Service still considered the water situation very serious. Congress then appropriated money to the Corps of Engineers to restudy its water control system in southern Florida. It was hoped that this restudy would lead to construction of a large flood control channel that would also insure an adequate supply of fresh water to the national park (32).

The Delaware River

The effect of the fourth year of the drought on New York City's water supply reopened the controversy over interstate allocation of the Delaware. By the early 1960's, New York City had long since abandoned the highly polluted Hudson River as a source of municipal water. It derived its water supply from three upstate reservoir systems at Croton, Catskill, and the headwaters of the Delaware River (which flows mainly through New Jersey and eastern Pennsylvania to its estuary in eastern Pennsylvania and Delaware). At the time of the drought, approximately one-third of the city's water supply was derived from the upper Delaware watershed.

In 1931, the U.S. Supreme Court had enabled New York City to build its Delaware watershed reservoir by ruling that the city was entitled to divert 440 million gallons a day (mgd) from the headwaters of the Delaware. This was the famous case of *New Jersey v. New York* in which Justice Holmes explained that "A river is more than an amenity; it is a treasure" (33). For this reason, Holmes ruled that the waters of an interstate river flowing between riparian rights States should be apportioned on the basis of comparative needs, not merely on the basis of the length of the riverbanks within each State. In 1954, the Supreme Court modified its 1931 decree by permitting New York City to increase its diversion to 490 mgd, but required that the city make compensatory releases from its reservoirs into the Delaware River to maintain a stated minimum rate of flow at Montague, N.J. (34).

After hurricanes devastated the upper Delaware in 1955, the four States of the basin and the Federal Government began forming a Federal-interstate compact. At the same time, the Corps of Engineers undertook leadership of an intergovernmental river basin planning effort, designed to

provide simultaneously for flood control, municipal water supply, water quality storage, and recreation. The Delaware River Basin Compact was enacted by Congress and the four State legislatures in 1961 (35).

The compact created a new form of water management agency, an interstate-Federal commission, on which the representatives of each of the four States of the basin and the Federal Government sat as five equal members. The commission had authority to develop long range water resources plans for the basin and allocate water among the States, in accord with the Supreme Court's 1954 decree. The commission also had the power to declare an emergency in time of drought or flood and, with the unanimous consent of its members, change allocations and direct changes in the diversions and releases required by the decree.

The Delaware River emergency had been created by the actions of New York City at the beginning of the severest summer of the drought. On June 14, 1965, the city stopped releases from its reservoirs, required by the 1954 Supreme Court decree, to protect its diversion, also authorized by the same decree. This had the immediate effect of causing salt water intrusion in the Philadelphia-Camden area and raised fears that the salt front would reach the Philadelphia water supply intake at Torresdale. (Philadelphia took its water from the nearby Schuylkill River tributary of the Delaware, relying on chlorinating polluted water to meet drinking water standards rather than importing pure mountain water (36).)

The Delaware River Basin Commission then acted under its emergency water supply powers to secure an agreement between the basin States and the Federal Government to rescue the Philadelphia water supply. On July 11, the commission declared a 30-day emergency (later extended), directed New York City to release up to 200 million gallons per day from its reservoirs (if needed), and also arranged for two private hydropower utilities to release 266 mgd from their reservoirs (37).

On July 14, President Johnson assigned the ad hoc Water Resources Council responsibility to enlist the help of Federal water agencies in dealing with the crisis of the Delaware and other emergency water supply problems of the Northeast. (Secretary of the Interior Udall, the chairman of the council, was also the U.S. member of the Delaware River Basin Commission.)

As a result of the ad hoc Water Resources Council's effort, HEW made available to the Delaware River Basin Commission data from its Delaware estuary project mathematical model showing what the reaction of the salt water front would be to various possible river flows and reservoir releases. The U.S. Geological Survey monitored the actual location of the salt

water front and made daily reports to the Delaware River master for use in regulating releases from reservoirs. The Corps of Engineers agreed to store and release water for low-flow augmentation in its Francis E. Walter flood control reservoir. HEW compiled information on drought effects for State water supply and pollution control agencies and undertook a water quality study of the Hudson River. HEW also undertook a study of water quality at various possible intakes for New York City's proposed Chelsea water purification plant. (A month later the Secretary of HEW called the first pollution conference on the Hudson, at the request of the Governors of New York and New Jersey.) The Department of Agriculture undertook actions to alleviate the feed shortage and to reestablish vegetative cover. In addition, the Federal Power Commission undertook to see whether it could direct further releases from licensed projects in order to increase the river flow (38).

On August 11, President Johnson called the Governors of New York, Pennsylvania, New Jersey, and Delaware, and the mayors of New York City, Philadelphia, Newark, Camden, and Jersey City to an emergency conference. On August 18, the President announced that the participants had agreed to a series of emergency measures worked out by a "water crisis" team under the direction of the chairman of the Water Resources Council and the Chief of Engineers. The President also declared the Delaware River basin was a disaster area within the meaning of the Federal Disaster Act, and hence eligible for financial assistance from the Office of Emergency Planning to install such measures. The measures included an emergency pump-pipeline system to be constructed by the Corps of Engineers at Lake Hopatcong, N.J., and drilling, by the U.S. Geological Service, of temporary wells in the underground Passaic Lake to relieve the critical water shortage in northern New Jersey. Philadelphia was to be helped to speed up the reconstruction of its Torresdale water intake and New York State to start construction on New York City's Chelsea intake.

In addition, New York City and Philadelphia reached agreement on what to do, for the duration of the drought, with the 200 mgd of reservoir water that New York City had been releasing under Delaware River Basin Commission order. The commission directed New York City to put the 200 mgd in a "water bank" where it could be stored for municipal water or released for low-flow augmentation—if needed to repel the salt front—on the direction of the Delaware River master. The commission also made it less probable that the 200 mgd of New York reservoir water would be needed by arranging for additional releases of 400 mgd from private power company

reservoirs and of 66 mgd from the Francis E. Walter flood control project (39).

On September 11, President Johnson announced a series of executive branch actions to help solve the Northeast's water problems on a permanent basis. These measures, recommended by the Water Resources Council, included the following:

- (1) A request for additional fiscal 1966 appropriations to speed up construction or planning of five water supply projects in the Corps Delaware basin plan, including Tocks Island, Beltzville, and Blue Marsh.
- (2) A request for supplemental appropriations to initiate the North Atlantic regional (NAR) framework study, by an interagency coordinating committee led by the Corps of Engineers. This was one of the Water Resources Council's 18 type I plans expected to provide the basic information on which more detailed plans leading to project authorization could be based.
- (3) Directions to the Secretary of Interior to report in 6 months on the potential of desalination to augment the water supplies of northern New Jersey and New York City (40). This study—done in cooperation with the Atomic Energy Commission, the Office of Science and Technology, and the Council of Economic Advisors—revealed no immediate potential for desalination in the area. Furthermore, future desalination would require very substantial cost reductions in the technical processes. The report found that New York City and northern New Jersey water supply facilities already under or nearing construction would meet the area's needs until at least 1980, and that treated Hudson River water would be the most economic additional source of supply (41).

It should be noted that not all Federal programs to deal with either the drought or the long-term water supply problems of the Delaware basin and its service area were initiated by the executive branch. Another approach was embodied in Representative Robert E. Jones' proposal for a northeastern U.S. water supply study, authorized by title I of the Rivers and Harbors and Flood Control Act of 1965 (42).

Title I directed the Chief of Engineers to cooperate with Federal, State, and local agencies "in accordance with the Water Resources Planning Act" in preparing a comprehensive plan to meet long-range water supply needs of the entire Northeast. This study, which became known as the NEWS plan, was not a framework study like the NAR plan; it was directed to include specific project proposals for reservoirs, aqueducts conveying water between river basins, and major water purification facilities. The NEWS plan was a limited-purpose study, not intended

to supersede the multiple-purpose plans that the Water Resources Council was already undertaking for several river basins in the Northeast. Instead, it was expected that reservoirs proposed in the NEWS plan would be incorporated in the type II plans of the Council and that the total plan could also be used by interstate compact commissions (43).

It was especially noteworthy that title I authorized the Federal Government to draw up plans for interbasin water importation by the cities of the Northeast. Importation of water was also being proposed in Congress at this time, as the solution to the water supply problems of the Colorado River and its service area and the Great Lakes basin. (Three months previously, however, Congress, in enacting the Water Resources Planning Act, had yielded to the insistence of the Columbia basin States by expressly forbidding any planning body operating under that act to study interbasin water transfers.)

Both the executive branch and the congressional "water establishment" were inclined to believe at this time that urban water supply crises, like the one on the Delaware, were the new water problem on which national water resources planning should concentrate. They believed that this problem could be solved by coordinated systems of new Federal-State reservoirs and aqueducts, combined with better sewage treatment and perhaps desalination (44).

Secretary of the Interior Udall, appearing in his capacity as WRC chairman, told the largely western membership of the Senate Interior Committee that the East had made very big investments in water development in the West. He stated that it was now time for the Nation to help the urban East solve its water supply problems. He further stated that the Tocks Island project, when it was built, would become the Grand Coulee Dam of the Delaware. Then, if Philadelphia and the cities of northern New Jersey were prepared to assume their financial responsibility for the building of aqueducts, they would have an assured long term supply (45).

This point of view was also expressed in the report of the House Committee on Public Works that accompanied the omnibus rivers and harbors legislation of 1965. It justified the NEWS plan on the ground that the drought on the Delaware had showed that the Federal Government must "cross another threshold" in the progressive development of water resources policy by playing a larger role in meeting the future water supply needs of an interstate megalopolis (46).

Lake Michigan

The Chicago Diversion Controversy

At the beginning of the 1960's, the most controversial water

issues in the Great Lakes basins concerned water entitlement. In December 1957, the six Great Lake States of Wisconsin, Minnesota, Ohio, Pennsylvania, Michigan, and New York had brought a suit, destined to continue for 9 years, against the State of Illinois and the Sanitary District of Greater Chicago. The eighth Great Lake State, Indiana, was not involved, but the United States had intervened in 1959 to protect Federal interests in navigation, pollution control, hydropower development, and good relations with Canada.

Most of these parties had been involved intermittently since 1922 in Supreme Court litigation to determine whether Chicago could divert water from Lake Michigan into the reverse-flowing Chicago River Sanitary Canal, into which the city discharged its sewage effluent. The canal flowed through the Des Plaines River into the Illinois River and ultimately into the Mississippi River system. Since 1932, the rule had been that Chicago could divert 1,500 cubic feet per second (cfs) for navigation and sanitary dilution into the Illinois waterway system plus "domestic pumpage." Domestic pumpage (which included industrial water acquired from the city water supply) had averaged about 1,700 cfs annually since 1932. It was not clear whether domestic pumpage was intended to be restricted to this amount or not (47).

In the early 1960's, the six other Great Lakes States alleged that the Chicago diversion caused declining water levels throughout the Great Lakes-St. Lawrence River basin and damaged navigation, riparian rights, and hydrogeneration. They petitioned that Chicago be required to return the treated sewage effluent from its domestic pumpage to the lake or reduce its domestic pumpage or its diversion into the Illinois waterway. The Great Lakes States contended that domestic and industrial pumpage could be materially reduced by reducing water waste. They further argued that Chicago's sewage effluent could be purified to the extent that it could either be safely returned to Lake Michigan or used to support navigation in the sanitary canal without need for so much dilution (48). (This cause was being tried before a special master appointed by the Supreme Court.)

Illinois and the Chicago Sanitary District opposed the demand that Chicago return its effluent to Lake Michigan. They contended that such a requirement was contrary to legal precedents (49) and would result in the pollution of the entire south end of the Lake and the ruin of all the Chicago beaches,¹¹ since

¹¹Chicago operated 14 major and 14 minor beaches, which were safe for swimming in the early 1960's, unlike the beaches of Milwaukee, Toledo, Cleveland, and other Great Lakes cities and towns, which returned their sewage to the basin.

lake water does not circulate nearly as rapidly as stream water. Chicago officials maintained that the city's sewage effluent was already the most highly treated of any large U.S. city, although it was still highly contaminating because of Chicago's large population (50).

Illinois further urged, with the support of the United States, that Congress had authorized the entire diversion of 3,200 cfs, including the 1,700 cfs for domestic pumpage, in the Rivers and Harbors Act of 1930, under its plenary power to regulate navigation. The State argued that congressional exercise of this power precluded reduction of the diversion by the Supreme Court (51).

In an additional related cause that was being tried together with the Chicago diversion case, Illinois was petitioning to establish the right of three west Chicago suburbs to obtain their domestic water supplies from Lake Michigan (52). Although the additional diversion they proposed was too small to be consequential, a decision establishing their right to take it would provide a precedent for hundreds of other communities to obtain their public water supplies from the same source.

The Supreme Court appointed a special master to take testimony and submit a report on these causes in June of 1959. The special master conducted 37 separate sessions of hearings between October 1959 and June 1963 in seven port cities located at various points on the Great Lakes; he also physically inspected treatment works, harbors, locks, and hydrogenerating plants throughout the Great Lakes-St. Lawrence River basins (53).

A major source of information used by the special master was data uncovered by the Public Health Service's Great Lakes-Illinois River basins comprehensive study. In 1960, after the United States intervened in the Chicago diversion case, the Department of Justice requested that PHS undertake a study of lower Lake Michigan and the Illinois River basin to supply information pertinent to the hearings. At the same time, Congress was considering an appropriation to permit a comprehensive pollution control study of the entire Great Lakes system. Made at the request of the Justice Department, the study became the initial phase of the larger Great Lakes comprehensive project that took 6 years and was the most ambitious water pollution control planning effort ever undertaken by PHS (54).

Judge Albert Maris, the special master in the Chicago diversion case, did not release his decision until December 1966. It turned out to be a decision that left the parties substantially where it found them. Chicago was not required to return its sewage effluent to the lake. Judge Maris also ruled that the entire existing Illinois diversion of 3,200 cfs was authorized by

Congress, but that Illinois was not entitled to increase its diversion (under the rule of equitable apportionment) (55).

The information gathered in the PHS study had more effect on public demands and Federal activities in the Great Lakes basin than the resolution of the diversion controversy. Not only did the study tend on the whole to support Chicago's claims concerning the excellence of its sewage treatment system and the probable effect of release of its sewage effluent into Lake Michigan, but it uncovered a great deal of information about the extent and sources of pollution in the Great Lakes. This information was used in the enforcement conferences on Lake Michigan and Lake Erie that were initiated in 1965 (56).

The Calumet River Conference

Although the city of Chicago treated its sewage and discharged it into the Illinois waterway, the Great Lakes study revealed that the Chicago area of Lake Michigan was receiving a barrage of pollution from other sources. Chicago and the southeast suburbs of Chicago, extending to Gary, Indiana, contained an industrial complex consisting of steel mills, oil refineries, paper, soap, chemical, auto, and food processing factories. These factories and several suburban municipalities discharged untreated or inadequately treated wastes into the Grand Calumet, Little Calumet, and Calumet Rivers, which flowed into Lake Michigan (57).

In March of 1965, the Secretary of HEW called an enforcement conference on the pollution of this interstate area. The conferees represented the water pollution regulatory agencies of Illinois and Indiana, the Chicago Sanitary District, and PHS. Working with the assistance of a State-city-industry technical committee, they quickly and unanimously agreed on an interstate pollution control program. This program was based on setting biological, chemical, and physical water quality criteria for the various subareas of the receiving waters to protect the present and potential use of the waters. The conference agreement required secondary sewage treatment and disinfection of all municipal wastes and patrol and operation of sewer systems to minimize bypassing of treatment facilities. Industries discharging wastes directly to the waters were to be required to disclose their effluents to the State regulatory agency or the Chicago Sanitary District. They were also required to install appropriate process changes or treatment facilities. The enforcement schedule provided that industries were to submit preliminary engineering plans by December 1966, final engineering plans by June 1967, and to complete construction of all facilities and put them in operation by December 1968 (58).

PHS officials were very enthusiastic about the first Calumet conference session at its close in early 1966. They were pleased with the stringency of municipal and industrial waste treatment requirements, the cooperative attitude displayed by State and city participants, and the apparent responsiveness of the industries involved. They believed that southern Lake Michigan would be a demonstration of the effectiveness of the water quality criteria approach to pollution control, which would soon be spread to the entire country under the Water Quality Act of 1965 (59).

Lake Erie

The most disheartening information discovered during the Great Lakes-Illinois waterways comprehensive study concerned Lake Erie. Lake Erie was the oldest and shallowest of the Great Lakes, and its five-State basin contained the largest population. Three highly industrialized centers of waste input into the basin were the Detroit area, the Cleveland-Akron area, and the Maumee River basin. The Lake Erie phase of the PHS study disclosed that all of the tributaries of the lake were polluted and that more than a fourth of the middle of the lake was without dissolved oxygen, beginning 10 feet from the bottom. Furthermore, losses to recreation and commercial fishing were much greater than on Lake Michigan.

Worse still, the natural aging process of the lake was being greatly speeded up by deposits of phosphates and nitrates.¹² The spread of the algae was turning the lake into a marsh (60). However, since the waters of shallow Lake Erie change entirely in 3 years (a longer period of time than in a flowing stream but a much shorter period of time than in deeper lakes such as Lake Michigan), PHS still considered that it was possible to arrest the eutrophication in time, by abating the overfertilization (61).

Nonetheless, PHS did not consider that it was in a position to initiate a Federal enforcement action on the basis of these findings. Section 10 of the Federal Water Pollution Control Act authorized the Secretary of HEW to call an enforcement conference on his own initiative only when he could prove the interstate nature of the pollution complained of. Since locating and following interstate water pollution in a Great Lake was costly and time consuming, PHS expected to confine its

¹²PHS concluded that nitrates are ubiquitous and recommended that abatement of eutrophication concentrate on removing phosphates (through proper design and operation of secondary sewage treatment facilities). It estimated that three-quarters of the phosphates in the basins were discharged from municipal sewers and that 66 percent of these phosphates were from laundry detergents. Land runoff was considered, at this time, to account for only 17 percent of the phosphates in the basin.

participation in Lake Erie pollution abatement to "voluntary enforcement actions"¹³ (on the pattern of the Detroit River conference of 1962) (62).

Meanwhile, as a result of the activities of public interest organizations and of press campaigns, public sentiment to "save" Lake Erie grew rapidly in 1964 and 1965, particularly in Ohio. On June 11, 1965, Governor Rhodes of Ohio formally requested that the Secretary of HEW call an interstate pollution conference on Lake Erie involving Michigan, Indiana (for the Maumee basin), Ohio, Pennsylvania, and New York (63).

The Detroit River and Michigan Waters of Lake Erie Conference, 1962-65

Ninety-two percent of Lake Erie's water enters the lake from the Detroit River. This river is actually a strait connecting Lake St. Clair (which, in turn, gets its waters from Lake Huron) and Lake Erie. In the early 1960's, the Detroit River was essentially a clean river at its start but picked up pollution as it flowed along and was grossly polluted by the time it entered Lake Erie. The major sources of pollution were:

- (1) Detroit and other communities that provided only primary treatment for domestic (and a considerable amount of industrial) sewage. Since Detroit also had a combined storm and sanitary sewer system, it also discharged raw sewage into the river at times of heavy rain.
- (2) A huge industrial complex of steel, auto, chemical, paper, rubber, and oil refinery plants which discharged untreated or inadequately treated waste into the Detroit River or its tributaries or into the tiny Raisin River, which flowed directly into Lake Erie (64).

In late 1961, Governor Swainson of Michigan requested a Federal pollution conference on the Detroit area water pollution situation. The first meeting was held in March 1962 between representatives of PHS and the Michigan Water Resources Commission. PHS agreed to make a detailed study of the waters concerned and make specific recommendations for abatement.

PHS completed its study and made its report in April 1965. The Detroit River conference, reconvening in June 1965, agreed that the Michigan Water Resources Commission would implement it. The second session of the Detroit River conference provided for what was now in the process of becoming the normal standard for Federal abatement actions: secondary treatment of municipal sewage plus disinfection. It provided for termination of combined sewer construction, patrol of sewer systems to prevent bypassing of treatment facilities, and

¹³This was the term used to describe State-requested conferences on intrastate pollution by individual metropolitan areas.

industrial sewage treatment based on disclosure of effluents to the State agency for use in State enforcement actions. In addition, the conference adopted, for enforcement by the Michigan Water Resources Commission, the new concept of effluent standards for both municipal and industrial waste dischargers (65).¹⁴

The Lake Erie Conference, 1965

The 1965 conference of the PHS and the water pollution control agencies of Michigan, Indiana, Ohio, Pennsylvania, and New York took place in two sessions in August—one in Cleveland and the other in Buffalo. The conferees based their conclusions on the July 1965 PHS Lake Erie report, which pointed out where the sources of various pollutants were located (66), and agreed on a general scheme for an ambitious program of municipal and industrial treatment plant construction (67). It was agreed that the State agencies would prepare construction schedules for consideration by the conference in 6 months time (68).¹⁵

This conference also recommended secondary sewage treatment and disinfection of all municipal wastes. In addition, the Lake Erie conference recommended that all secondary treatment be designed and operated to maximize removal of phosphates (69).¹⁶

The conference also recommended banning new combined sewer construction, eliminating existing combined sewers when feasible, and operating existing combined sewer systems to avoid bypassing treatment plants. Needed waste treatment facilities at Federal installations were to be completed and in operation by August 1966. The conferees were to meet with government officials responsible for agricultural, highway, and community development programs to devise means of controlling runoff. In addition, the conferees were to meet with

¹⁴The Detroit River conference adopted the effluent standards recommended in the PHS Detroit River report. These were specific limits on concentrations of specific pollutants discharged at specific waste discharge points. But no effluent standards were proposed for phosphates. Instead, the report recommended that a technical committee appointed by the conferees evaluate phosphate removal by planned secondary treatment facilities and make further recommendations on the basis of such evaluation after they were installed.

¹⁵When the conference reconvened for its third session in June 1966, it agreed that the State agencies would see to it that all municipal and industrial waste treatment facilities were in operation by January 1970.

¹⁶This recommendation was one of the most heralded achievements of the conference. However, it was not clear whether the States were to consider it a requirement or an ultimate objective. (It was understood that phosphate removal by improvements in technology might prove very expensive.) The technical committee, set up to report to the conferees on Lake Erie nutrient removal problems in early 1966 made no recommendations concerning removal methods at its first meeting. It merely proposed that the new Federal Water Pollution Control Administration be responsible for providing information to a technical task force in each State.

representatives of the Army Corps of Engineers within 6 months to develop a program for disposal of dredged materials from Lake Erie harbors elsewhere than in the lake.

The conference also recommended that industrial plants improve waste treatment practices to maximize reductions of 11 categories of pollutants. The State agencies agreed to ensure that industrial plants discharging into the basin analyze the contents of their effluents and make reports on pollutants in terms of both concentrations and load rates. This information was to be maintained in open files by the State agencies for all those having a legitimate interest in the information.

In addition, HEW was to establish water pollution surveillance stations on the lake. Surveillance on tributaries would be the primary responsibility of the States, but HEW would provide assistance when requested. The five State agencies and the Federal agency would encourage regional planning of sewer systems and treatment plants (70).

Detergents

Synthetic detergents had come into general use in the United States soon after World War II. The availability of automatic washing machines, the spread of commercial self-service "laundromats," and the obvious superiority of detergents,¹⁷ particularly in hard water, had led to a quick conquest of the market by the new products. By the early 1960's, about 90 percent of U.S. household laundry and dishwashing products were detergents (71).

A great deal of public concern had developed by this time about one highly visible form of water pollution resulting from detergents: foam. Rivers foamed in serene woodland settings, like the Illinois River at Starved Rock State Park in Illinois, for example. Drinking water (from wells in suburban neighborhoods throughout the country) came out of the tap with a head on it, like beer. This was because, at that time, the sudsing surfactant used in synthetic detergents,¹⁸ the petrochemical, alkyl benzene sulfonate (ABS), was very slow to decompose in water. The foam was not only unsightly, it also clogged up sewage treatment plants and interfered with the aeration process, thereby raising the cost of treatment (72).

¹⁷Strictly speaking, ordinary soap, or anything else used for cleaning, is a detergent. But in this report (as in common usage) the term "detergent" is used to mean synthetic detergent.

¹⁸Commercial detergents in the early 1960's were typically composed of: a surface active agent ("surfactant"), to do the actual cleaning; phosphate "builders," to enhance the surfactant's cleaning power; and small quantities of other additives such as whiteners, brighteners, anticorrosion chemicals, etc.

In early 1963, bills were introduced in both houses of Congress that would have required detergents to meet standards of decomposability, set by the Secretary of HEW, by June 1965 (73). Congressional hearings in 1963 and early 1964 revealed that the detergent industry was not convinced of the public necessity of undertaking the expensive changeover to biodegradable detergents. Industry spokesmen asserted (and were supported in this assertion by the PHS and science specialists of the Library of Congress) (84) that allegations that ABS was harmful to public health or to fish and wildlife had never been satisfactorily proved. Foam was thus to be regarded as an aesthetic nuisance, not a real problem. Indeed, industry spokesmen pointed out that the situation the public found most objectionable (the foaming tap water that resulted when domestic sewage from septic tanks got into drinking water wells) could be regarded as a harmless but visible signal of more dangerous pollution from untreated human wastes. The best solution to this problem would be to discontinue using septic tanks and build sewer lines (75).

Nonetheless, detergent manufacturers and their chemical suppliers were well aware of the bad public image of foaming waters and had begun research into biodegradable surfactants in the early 1950's (76). After Representative Reuss introduced the first bill to regulate the biodegradability of detergents, in January 1963, the industry's efforts were speeded up.

In April 1963, members of the Soap and Detergent Association unanimously agreed to an industrywide plan providing for the complete replacement of ABS by the biodegradable surfactant, linear alkyl sulfonate. As a result, the detergent regulation bills died in committee in 1964 (77). The changeover was scheduled for December 1965 but was actually accomplished 6 months ahead of time, in June (78).

It was just at this point, when the detergent industry had voluntarily completed one expensive change of ingredients, that the public became aware of the much more serious problem produced by the phosphate "builders" in detergents. According to PHS findings that became known in the summer of 1965, phosphates in detergents were one of the causes, if not the principal cause, of the eutrophication of Lake Erie. However, in its 1965 Great Lakes enforcement conferences, PHS did not recommend that the phosphates be removed from detergents as ABS had been removed. Instead it recommended secondary treatment for all municipal sewage running into the lake, with maximum phosphate removal.

PART II. WATER IN THE NATIONAL MIND

4. THE IDEOLOGICAL BACKGROUND OF FEDERAL WATER PROGRAMS, 1961-70

The Influence of Ideologies— Continuities and Discontinuities

By the time President Kennedy was inaugurated in 1961, Federal jurisdiction over navigable waters and Federal proprietary powers over waters of the public domain had led to Federal participation in every aspect of water management. This meant that a variety of water management issues were included in one important aspect of American politics—the local politics of ongoing Federal programs in the vicinity of the operations of such programs.

In addition, a number of issues involving water had captured the national imagination and had been incorporated into national party politics or the politics of nonpartisan ideological movements. Federal water resources programs generally had their origins in political issues that were considered very important by the Nation as a whole, even if program benefits were intended to be regional or local. Once Federal water programs were established, however, the Nation frequently lost interest in the issues that had led to their creation. The continuation and further development of the programs were thereafter based on the professional judgments of the government technicians charged with implementing the programs and the pressures exerted by the programs' geographical and economic clientele. The ideologies that had originally created the programs continued to influence their supporters, in most cases, and remained at the back of the national consciousness, ready to be called to the fore again when warranted by the situation.

The ideological currents that produced Federal water programs before 1960 were discussed in the first volume of this history in considerably more detail than seems appropriate here. But it does seem useful to summarize them briefly to illustrate the continuity of such currents into the 1960's.

The Federal navigation improvements program had its origins in the westward expansion. This program later slowed down as a result of the development of railway transportation.

But the navigation program was revived by an agrarian resentment of high railroad rates, which was related to a national movement in favor of small enterprises (and small towns) and against monopolies. In the 1950's and 1960's some local political leaders looked to the development of inland ports as a way to bring economically and geographically isolated cities into the mainstream of economic growth (1).

Federal flood control programs had tended to expand after every catastrophic flood. They originated in the sympathies of a Nation, which valued self-reliance, for the victims of an act of God that could strike the prudent and the imprudent alike. And they also reflected typical American pride in the modern technologies that could prevent such natural catastrophes from happening.

Multiple-purpose river basin development programs featuring irrigation, electric power, or both, had their origins in two strong ideological currents that had been part of the progressive conservationist movement. These two points of view were most important in national politics from the progressive period to the end of the New Deal. But they continued to influence supporters of river basin planning programs during the Truman and Eisenhower administrations. They also provided much of the basis for congressional and public interest group support for the establishment of the Water Resources Council in the 1960's. The two ideological viewpoints were:

- (1) Belief in comprehensive river basin development as an engineering concept. Many Americans admired ambitious multiple-purpose water projects because they were such splendid examples of the ability of technology and the "scientific" attitude to provide solutions to human problems. It was obviously less wasteful to save the floodwaters to provide irrigation and municipal water. It was obviously more efficient to produce flood control, electric power, irrigation water, navigation improvements, municipal water, and recreation by well-planned integrated projects, than by unrelated individual efforts. The fact that power and water produced by such projects could be sold to recoup the costs of building them strengthened belief in the efficiency of such efforts. People felt much the same kind of national pride in great structures such as the Hoover and Grand Coulee Dams and the generators of TVA and Bonneville that a later generation was to feel in the rockets and capsules of the space program.

In the 1960's, the enthusiasm of congressional committees and the Kennedy-Johnson administrations for government-supported research into desalination and waste water reclamation and much of the support for great interregional

water diversion plans had their roots in the same ideological position.

- (2) Belief in comprehensive river basin development as a "social engineering" concept. Many Americans believed in the principle that the Nation's water resources should be managed by the Government for the benefit of the people and not "exploited" by private and necessarily monopolistic interests. Such public enterprise would make it possible to develop water resources, not only for economic development (as in the engineering concept of river basin development), but also for greater distributive equity and a better quality of life. This would be accomplished through the media of low-priced electricity for household use,¹ low-priced irrigation water, government soil conservation and farm management assistance, and reservoir recreation opportunities.

This belief in natural resource development as a means of community social improvement was to become part of the ideology of the Kennedy and Johnson administrations in the 1960's, as shown by the resource conservation and development program legislation in 1962 (2) and the Appalachian Regional Development Act of 1965 (3). An attenuated echo of this belief could even be heard in provisions for grants and loans to water and sewer facility construction in the Area Development Act of 1961, and in 1965 urban development (4) and distressed area legislation (5).

During the New Deal period, public investments in water resources projects were also looked at as psychologically constructive and politically feasible ways to provide jobs for the unemployed. Although this was not done during the prosperous Truman and Eisenhower administrations, neither was it forgotten. Belief in the effectiveness of public works investments to stimulate the economy had become a traditional element in Democratic Party ideology. It was taken up by Democratic congressional leaders during the 1960-61 recession, and expressed by the incoming Kennedy administration in the Accelerated Public Works Act of 1962 (6).

Another echo of this New Deal policy was provided by two depressed area programs established in 1965: The Appalachian

¹The progressive movement-New Deal belief in the use of low priced Federal water power as a "yardstick" for power rates of private electric companies also survived into the 1960's. It was dramatically demonstrated in the support of the Johnson administration and bipartisan New England senatorial delegations for the virtually single-purpose Dickey-Lincoln School Project in northern Maine. Although this project, intended to be the first Federal hydroelectric project in New England, was authorized in 1965, it was repeatedly denied funding by a coalition of supporters of private power development and supporters of nature preservation.

regional development and the Economic Development Administration programs (7). But these programs provided for water resource development to expand regional economic opportunities in one case (8) and to help create long-term employment for low-income families in the other (9). They did not merely provide temporary stimulation for local construction industries.

It is one of the theses of the first volume of this history that during both the Truman and Eisenhower administrations, the geographically-based congressional committees responsible for the legislation of individual water programs rejected presidential leadership. Instead, they assumed responsibility for the development of such programs themselves. This meant that many important changes in Federal water programs at this time were based less on national politics than on interaction between local politics and the often client-oriented thinking of Federal water agencies. However, Congress as a whole was willing to enact these changes, not only because of "log rolling" considerations, but also because the new developments were based (at least in part) on ideological positions that had been recently important to the Nation and could still claim the loyalty of large sections of the public.

An example of this type of water resources program development was provided by SCS's small watershed program, which was inaugurated in 1954 with the passage of P.L. 566 (10) and significantly amended in 1956 (11). This program had its origins in the desire of upstream landowners to enjoy the same protection from agricultural flood losses that were available to downstream landowners under the Corps of Engineers flood control program. As pointed out by Morgan in 1957 (12), it was not really wanted by the Eisenhower administration, which would have preferred that local interests pay for such enterprises themselves. The small watershed program was also a departure from the entire river basin plan approach to upstream development that had been advocated by Secretary of Agriculture Brannan in the Truman administration. The program was promoted by the new National Association of Soil Conservation Districts, supported by SCS, and secured by congressional friends of SCS in both parties, after encountering some resistance from congressional friends of the Corps of Engineers. But the program obtained a majority of the votes of Congress, largely because of the conservationist "rightness" of the idea of "stopping the floods where the raindrops fall" (13).

Other new water programs that emerged during the late 1940's and the 1950's, such as the Public Health Service's water pollution control programs and the river basin planning program of the Fish and Wildlife Service and the National Park

Service, did not have such specific economic and geographic clientele. During the late 1940's and the 1950's, these programs did not have such single-minded, strategically concentrated congressional support. Instead, they represented the increased interest in nature and outdoor recreation of an increasingly affluent and urban nation. They had the support (except when they were criticized for not being effective enough) of the organized conservationist movement, which, as we shall see, became progressively stronger and more politically powerful during the 1960's.

During the late 1950's and the 1960's, political scientists and other critics contended that Federal water programs were very responsive to the interests of specific geographically-oriented clientele but not very responsive to the needs of the Nation as a whole, which paid so much of the bill (14). Furthermore, these critics sometimes identified the Nation at large as being predominantly urban, settled in fully developed areas, and suffering more from water pollution than water shortages (15). Economists and other social scientists argued that the willingness of the Federal Government to invest in water projects discouraged the use of more efficient alternatives. They pointed out that there were many means other than water projects to accomplish such objectives as flood damage prevention, power production, freight transportation, increased food production, and/or regional economic development (16).

During the early 1960's, government leaders paid relatively little attention to criticisms of the inefficiency of water projects as means to resolve particular problems. This may have been because they were inclined to think that if the public agreed that a particular problem was worth solving, the public didn't really require absolute efficiency in the means of solution. But—as indicated by the Federal response to New York City and Philadelphia water shortages—both the executive branch and congressional leaders were very sensitive to criticisms of Federal water programs as benefiting only western, southern, or rural clientele. They felt that the prevalence of such criticisms demonstrated that the clientele of Federal water programs was too narrow. Consequently, they wanted to adjust the programs to include more attention to purposes that would benefit the urban part of the Nation, such as water pollution control, municipal water supply, outdoor recreation and scenery, and preservation of unique natural sites as tourist attractions (17). The solutions that were proposed (apart from proposals to spend much greater sums on treatment plant construction grants, which will be discussed later) were the following:

- (1) Centralizing control over the policies of all Federal water

programs (and, where necessary, changing their enabling legislation) to ensure that they incorporate urban-oriented values into water project and river basin developments (18).

- (2) Fully involving the State and local governments (which were primarily responsible for water and sewer systems, treatment plants, waterfront land use regulation, and local recreation developments) in intergovernmental river basin planning efforts. This also required assisting State and local governments to undertake their own water resources planning and development efforts (19).

What happened to these proposed solutions in the 1960's? To a considerable extent—especially, as we shall see, in the second half of the decade—they were carried out. But, as every casual newspaper reader of the 1970's knows, these changes did not satisfy the ideological critics of Federal water programs.

In the second half of the 1960's, the conservationist movement, which had played such an important part in the origins of Federal water programs, gave birth to the environmental movement. By the end of the decade, environmentalists were looking with a suspicious eye at the ecological effects of all water project proposals (except sewage treatment plants). And this was just as true of projects for outdoor recreation and water quality storage as it was of proposed hydroelectric dams and barge canals. Furthermore, by the end of the decade, the environmental movement appeared to have developed a wider base of political support than the old conservationist movement ever had. The stage was set for the legislative accomplishments of the year 1970—the year that, in the words of the first report of the Council on Environmental Quality, “historians may one day call . . . the year of the environment” (20).

Explaining what the environmental movement was, how and why it came to have such a powerful influence on the thinking of our times, and how it changed some aspects of Federal water resources programs while leaving others the same, is one of the principal tasks of this history.

The Conservation Movement

The American conservation movement had played an important role in the origins of almost all Federal water resources programs. The movement had begun in the latter half of the nineteenth century as a kind of philosophy of nature,

prevalent among scientists.² But it became a significant political movement during the “progressive period” of the early twentieth century.

From the beginning of conservationism as a political movement, it was rooted in two distinct philosophies: (1) preservation, and (2) planned development and wise use. These two points of view had seemed for many years to be closely related and reasonably compatible.³ However, after World War II, they came increasingly into conflict. By the beginning of the 1960's, there were frequent disputes about which was really entitled to the name of conservationism (21).

Preservation

The preservationists had typically been led by non-government scientists such as Marsh, Muir, and Aldo Leopold, and supported by clubs of sportsmen and nature lovers. They had played the leading role in public education and political agitation for inviolate national parks and reservations, wildlife protection measures, and protection of the scenic values of river valleys threatened by dams. They had also been active and enthusiastic supporters of expanded water pollution control programs. During the 1960's, preservationists also became involved in efforts to protect the distinctive life systems and scenic values of coastal and estuarial areas.

The preservationist's point of view was ecological. It affirmed that the balance of natural systems of soil, water, animals, and vegetation should be disturbed as little as possible, or the result would be destruction, extending ultimately to man himself.

However, until the late 1960's, preservationists usually focused their attention on the protection of rare natural assets in sparsely populated areas whose inhabitants were frequently inclined to prefer development of the resources, for whatever economic benefit might result, to preservation. Until the late 1960's, preservationists were seldom involved in movements for improvement of ordinary environmental relationships or general outdoor recreation opportunities (22).

During the 1960's, this situation changed somewhat because a number of preservation-versus-development disputes arose that were located near major centers of population. Such issues

²The event that is frequently referred to as the beginning of the U.S. conservation movement is the publication in 1864 of George Perkins Marsh's influential book, *Man and Nature*. Marsh was what today is called an ecologist. He studied various kinds of “natural harmonies” and called for their preservation from the destructiveness of man.

³Even during the progressive period there were some preservationist-versus-developer controversies. The most famous was the feud between Gifford Pinchot and John Muir over the flooding of beautiful Hetch Hetchy Valley in the Sierras to provide water and power to San Francisco.

as saving San Francisco Bay, or the Indiana Dunes, or Lake Erie involved preservation of outdoor recreation and scenic resources used by large numbers of people. They also brought preservationists into alliance with groups interested in recreation planning. Thus the "Save the Bay" movement in San Francisco, for example, was interested not only in preserving the ecology of the remaining bay marshes but in public acquisition of the shoreline for parks.

Development and Wise Use

The utilitarian or progressive conservationists were led initially by Theodore Roosevelt's Chief Forester, Gifford Pinchot, and other government agency and political figures active in the progressive movement and the New Deal. These were the people who had initiated Federal programs for multiple-purpose development of water resources as well as multiple-use forestry and soil conservation combined with scientific farm management.

These conservationists wanted public planning of the development of resources to "maximize the use of resources for the greatest good of the greatest number of people." Thus, they favored multiple-purpose river basin development to provide a number of benefits for a wide variety of interests. Some favored full regulation of the flow of nearly all streams in the Nation in order to prevent the waste of unproductive flood waters. They pointed with pride to the Tennessee and the Colorado as two rivers for which this desirable goal was almost achieved (23).

Since future generations were among the people whose greatest good must be considered, a degree of resource preservation was one of the goals of the progressive conservationists. Thus, fish ladders were to be built in dams to prevent extermination of salmon, and soil conservation practices were to be installed upstream of dams, both to preserve soil fertility and to slow down silting up of the reservoirs. Flat water recreation was also increasingly considered important (although its value was not incorporated into benefit-cost analyses until the mid-1960's). Spokesmen for the dam-building agencies boasted that their recreation facilities were far more frequently visited than the preservationist's national parks (24).

As Lynton Keith Caldwell, Grant McConnell, and other analysts of the conservation movement have pointed out, progressive conservationist solutions to environmental management problems were inclined to be democratic and relativistic. For example, let all interests in a stream be considered. Let those who want to preserve the stream for scenery or fishing be put on the same footing with those who want to use it for waterpower, irrigation, or industrial waste disposal.

Then let the public's water use preferences (expressed through a free play of economic and/or political forces) determine the water management scheme (25).⁴

Progressive conservationist ideas had rallied a great deal of ideological and political support during the New Deal and for many years thereafter. But this support became more attenuated during the postwar period, when advances in technology and the prospect of substitutes for nonrenewable resources had made water resource management seem a less plausible basis for providing regional prosperity. Henceforth, the greatest concentration of progressive conservationist ideas was to be found in the resource development agencies themselves.

Thus, McConnell, writing in 1954 (26), reported that the organized conservation movement was much reduced from its former strength and that what remained consisted almost entirely of groups outside the progressive tradition. McConnell pointed to the slightly fewer than 40 clubs and societies that were affiliated with the Natural Resources Council of America as the best available representation of the then contemporary conservation movement. Most of these groups were single-resource preservation groups—the largest number were concerned with preservation of wildlife for hunting and fishing. Other groups were interested in bird preservation, wildflowers, soil conservation,⁵ national parks, and wilderness. There were also a number of scientific societies. All of these groups considered that the resource they wanted to protect was, in itself, a superior value to the claims of society on that resource. They were united by an appreciation that the preservation of each of these values was compatible and even complementary to the preservation of the others and by a consciousness that the values all of them cherished were noncommercial.

Most of these organizations were part of the successful opposition to building Echo Park Dam, but they failed to marshal sufficient support for their opposition to other reservoir projects, including Glen Canyon Dam, which was part of the same upper Colorado River basin storage project.

It was during the 1960's that the conservation movement changed from a coalition of groups of "fanatical" hobbyists whose ideas were outside the mainstream of political life to the nucleus of the powerful environmental movement of 1970.

⁴This was not true of preservationists. Since they viewed natural systems, such as streams, as dependent on the balance of nature for survival, maintaining that balance was an absolute good. They, therefore, believed that the administration of nature must be based on scientific facts—irrespective of popular preferences which might be uninformed or shortsightedly selfish.

⁵The soil conservationists were the one group that was at once genuinely preservationist and necessarily developmental.

The Effects of Urbanization, Population Growth, and Economic Growth

The 10 years between the end of 1960 and the end of 1970 were 10 years of great national population growth and growth of urbanization, almost matching the preceding decade of unprecedented growth. In 1950, 95 million Americans had lived in metropolitan areas of 100,000 persons or more. In 1960, this figure had grown to 120 million. By 1970, it had risen to 140 million, making a total increase in 20 years of 45 million people in the large city areas where air and water pollution was most serious and trees, grass, and wildlife were scarcest.⁶ In the same period, population in the rest of the country increased only 7 million, and population in rural areas of under 2,500 persons decreased about 400 thousand (27).

However, national economic growth gains during the 1960's were even greater than the record increase of the 1950's (28). Not until 1970 did it appear that some tapering off might be in sight. There had been four fairly serious recessions during the prosperous Truman and Eisenhower administrations (in 1949, 1953-54, 1957, and 1960). But there were no such serious cyclical lows between 1961 and 1969 (29). There was a poverty problem to be sure, but that was viewed as a sociological problem caused by racial discrimination and other social conditions, not by any weakness in the economy.

Thus, an April 1970 *New York Times Magazine* article written by Edwin L. Dale, Jr., a reporter specializing in economic affairs, was one of many that attributed the phenomenal increase of public interest in the preservation of nature since the 1960's to an equally phenomenal increase in pollution caused by affluence. This increase in pollution was attributed not so much to population growth and urbanization as to the rise in gross national product (GNP). The article pointed out that the GNP had increased only \$100 billion (in constant dollars) in the 13 years between 1944 and 1957, but \$300 billion between 1957 and 1970. It asserted that the GNP was expected to rise more than \$500 billion in the next 13 years, causing a frightening increase in pollution unless the public sector undertook much more stringent antipollution measures in the future than it had in the past (30).

Davies, in the *Politics of Pollution*, attributed the increase of air and water pollution to the three factors of population

⁶It is also of some significance that many of the most populated of these large city areas were located on or near coastal estuaries or on the shores of the Great Lakes.

growth, increased urbanization, and increased affluence. He noted the following three effects of affluence on pollution:

- (1) Affluence increases pollution by increasing industrial and agricultural production (which is augmented by such polluting substances as synthetic chemicals, pesticides, fertilizers, etc.) and by the prevalence of such polluting luxuries as automobiles, washing machines, and garbage disposals.
- (2) Affluence increases public interest in the nonmaterial amenities of beautiful scenery and outdoor recreation.
- (3) Affluence also provides society with the funds and technology necessary to deal with the pollution problem (31).

An additional effect on public thinking about the environment during the long upward trend of the 1960's was not so much the effect of the affluence itself as of the productivity of the technology that had created the affluence (and was also such a large factor in creating pollution). This was the optimistic belief among both the public and some intellectual leaders that technological improvement in production had made unnecessary the old conservationist fear of running out of natural resources needed for prosperity (32). There were large agricultural surpluses throughout the decade, despite USDA's production-curtailing commodity and acreage control programs. And the development of offshore oil drilling, natural gas production, strip mining, and atomic energy had made the old predictions of dire consequences to follow in the near future, when the United States ran out of fossil fuels, seem ridiculous.

In this intellectual climate it was not surprising that the thesis of the Senate Select Committee on National Water Resources in 1961 (that the U.S. economy and quality of life would be threatened by water shortages unless ambitious new water development ventures were undertaken) was not really widely believed by the public (33)⁷ except in the arid West (34).⁸ It received a temporary boost in public attention at the height of

⁷This thesis was also rejected by the academic community concerned with water resource problems. The water scholars were generally inclined to think that the regional water supply problems of the 1960's were the result of misallocation of water or local mismanagement rather than genuine scarcity. They recommended such measures as realistic pricing of irrigation water, chemical treatment of polluted nearby supplies for drinking purposes, and universal metering of city water rather than large impoundments and interbasin diversions.

⁸By the end of the decade, there was also considerable sentiment for preservation rather than water development in urban areas of the arid West too. Thus, for example, the files of the National Water Commission reveal that, at the 1969 hearings of the commission at Los Angeles, witnesses from local government planning and water quality agencies, local units of conservation organizations, and the League of Women Voters asked for more Federal help with pollution abatement while criticizing the environmental effects of the California State water project.

the New York City water shortage. But the Northeast urban water shortages, once over, did not recur during the decade. In contrast, the problems of the eutrophication of Lake Erie, the filling in of San Francisco Bay, the pollution of Lake Michigan, the Potomac and Hudson Rivers, and other waters with large populations on their shores did not go away. Throughout the second half of the decade, news stories pointed out that all of these well-known situations of environmental deterioration of water resources were getting worse, rather than better.

Environmental Causes of the 1960's that Affected Water Programs

Several events which strengthened public support for a preservationist rather than a development-oriented attitude toward water resources had already occurred or were occurring by the middle of the decade. Two have already been discussed but are sufficiently important to justify further examination:

- (1) The growth of public awareness of water pollution in various areas of the country and the struggle for more effective water pollution control. This was one of the causes that brought conservation organizations together with associations of local government officials and local planning and citizens' associations.⁹ For instance, it brought the League of Women Voters, a "good government" organization which had never displayed any interest in wildlife, into the environmental movement (35).¹⁰
- (2) The growth of public awareness and dissatisfaction with proposed water development projects that would impinge on particularly precious natural resources. Public resentment in the early and middle 1960's of

⁹The other cause which had this effect, as we shall see, was the related cause of preservation of estuaries, beaches, and shoreline resources.

¹⁰The League of Women Voters, a nonpartisan political study and lobbying organization, whose methods of operation evoked a great deal of membership participation, had about 150,000 members in the late 1960's. The League had become involved in lobbying for numerous State and local water pollution control measures as a sequel to its nationwide "know your river basin" studies begun in 1956. The League testified before Congress on proposals for amendments to the Water Pollution Control Act throughout the 1960's. In 1969, it spearheaded the highly effective Citizens' Crusade for Clean Water, which will be discussed later. In 1970, it adopted "evaluation of measures to achieve and maintain a physical environment beneficial to life" as one of four domestic policy issues in its national program.

developments affecting the Grand Canyon, the Everglades, San Francisco Bay, and the Indiana Dunes had much to do with creating support in 1969 and 1970 for the principle of examining the environmental impact of all projects no matter how modest their surroundings or obscure their location.¹¹

These well-known preservationist issues were also part of a broader movement for protecting and enhancing natural beauty. This movement also found expression, in the early and mid-1960's, in such matters as planting trees in urban areas and opposition to overhead electric wires and roadside billboards. Protecting the aesthetic values of nature, as an amenity that the more affluent, idealistic, and better educated America of the 1960's could afford and appreciate, gained earlier and more widespread public support than the cause of protecting the balance of ecological systems with which it was destined to merge.

Pesticides

A controversy concerning pesticides of the early 1960's won many converts to the ecological cause. Rachel Carson's 1962 best selling book, *Silent Spring*, drew public attention to the tendency of persistent chemical insecticides in soil and water to concentrate as they rose in the food chain, causing damage to wildlife and perhaps eventually to human life. Carson's message was that the use of persistent pesticides (such as DDT, endrin, aldrin, and others) was a serious threat to the balance of nature and should be eliminated or minimized. Her message was opposed by a substantial segment of the scientific community. However, by the end of the decade, opposition to persistent pesticides had gained considerable adherence, in part as a result of the Mississippi fish kills and other pesticide "incidents" (and also in part as a result of U.S. Fish and Wildlife Service research). This resulted in a number of changes in Federal policies and procedures, including limitations on persistent pesticides in State-Federal water quality standards, more cautious use of pesticides in Government-sponsored pest control programs, and increasingly strict regulation of pesticide use by USDA and HEW.

The Mississippi fish kills of 1963-64 were well-publicized events demonstrating that negligent release of pesticides into the environment (if not their use on farms) could cause substantial ecological damage. Beginning in November 1960, seasonal fish kills had occurred every fall and winter in a four-State area

¹¹Preservationist protests against proposed Federal water projects in the second half of the decade will be described in later chapters of this book in the context of the program of the agency involved.

of the lower Mississippi and Atchafalaya Rivers and their estuarial waters of the Gulf of Mexico. In early investigations, State and Federal agencies had been unable to determine their cause. In November 1963, an extraordinary fish kill had destroyed more than 5 million fish, temporarily ruining both the use of the water for recreation and the commercial fishing industry. The Louisiana Water Pollution Division then requested that PHS investigate the cause. PHS scientists found that the fish were killed by the persistent pesticide, endrin. A team of PHS investigators found that the principal source of the endrin in waters of the basin was industrial sewage and waste-lot drainage from a single manufacturing plant near Memphis, Tennessee (36).

The Secretary of HEW then called an interstate pollution abatement conference at which the State of Tennessee dissented from the majority conclusion that industrial waste was the principal cause of the pollution. The conference recommended that "known sources" of endrin discharges from industry be abated and that PHS lead a team of investigators in monitoring actual abatement (37). During 2 years of 24-hour surveillance of the outfalls of the plant that PHS had pinpointed as the principal source of the endrin, the levels of endrin in the waters gradually reduced. When the management of the plant changed hands in 1966, the PHS team was permitted to enter the plant to inspect the waste discharge process. The remaining endrin pollution from the plant was abated by comparatively inexpensive measures (38).

In addition to contributing to the growth of public support for preservationist contentions concerning the fragility of life systems, the Mississippi fish kill had the following effects on public, congressional, and Federal agency thinking concerning water pollution control:

- (1) It illustrated the cumbersomeness of Federal enforcement conferences as a device to abate industrial pollution, even in an atypically simple case.
- (2) It was one of the earliest incidents to raise the question of whether harmful substances not susceptible to removal from water by sewage treatment should be banned entirely. Endrin raised this question even more forcefully than phosphates in detergents because it contaminated food fish and there was reason to believe that it and other persistent pesticides (in sufficient, but undetermined, quantities) could cause damage to man.

The question of banning pesticides as a means of preventing contamination of food fish was raised again in the last few years of the decade with more results. In 1968, the four-State enforcement conference on the pollution of Lake Michigan

found, among other kinds of pollution, very high levels of DDT, DDD, and dieldrin in certain species of commercial and sport fish. This contamination apparently resulted, not from industrial carelessness (as in the case of the Mississippi fish kills), but from land runoff from both urban and rural areas.

The Lake Michigan conference recommended concerted action by all the States of the upper Great Lakes basin (39). In 1969, a four-State Governors' conference on pesticides recommended that all the States of the basin take administrative or legislative action to phase out the use of persistent pesticides (40). Also in 1969, the U.S. Food and Drug Administration seized 28,000 pounds of Lake Michigan coho salmon from commercial fishermen because the fish contained much more DDT than the official tolerance level of 5 parts per million.¹² In response to the public outcry which followed, the Secretary of HEW appointed the Mrak Commission to study the health effects of pesticides (41). The resulting recommendations of the Mrak Commission for closer interagency cooperation on pesticide regulation, elimination of most U.S. uses of DDT and DDD in the next 2 years, and restriction of the use of other persistent pesticides became the basis for new Federal policies in the 1970's (42).

Mercury

Another event persuaded the public, Congress, and the executive branch to think of water pollution control as involving the regulation of the technology of production. In the spring of 1970, the public was horrified by reports concerning methyl mercury, a water-soluble poison that rises in the food chain and causes brain damage in humans (43).¹³ Possibly dangerous concentrations had been found in U.S. and Canadian waterways that received industrial wastes containing metallic mercury.

When faced with a well-publicized industrial pollution situation that was a clear threat to public health, both the chlorine industry (which had been discharging an estimated million

¹²In the early 1970's, scientific researchers were to discover that some of the residues in Lake Michigan coho salmon that had been identified as DDT were really equally toxic and persistent PCB, presumably discharged into the lake in industrial wastewaters. PCB, which was used in capacitors, plasticizers, adhesives, sealants, and printing inks, and as transformer fluids and heat exchangers, was hard to distinguish from DDT by methods of chemical analysis generally used in the 1960's.

¹³During the 1950's, a Japanese plastics factory dumped large quantities of alkyl mercury into Minamata Bay, Japan. Between 1953 and 1960, a mysterious ailment developed among the local people causing 40 people to die, 70 to become seriously disabled, and 19 brain-damaged children to be born to mothers who themselves had been little affected. In 1960, the cause was found to be mercury poisoning from the local fish that were an important part of the community's diet.

pounds of mercury a year into U.S. and Canadian waters) and the government moved promptly to abate it. The multi-billion-dollar chlorine industry met and exchanged information on techniques of detecting, measuring, sealing off, and recycling the poisonous liquid (44).

In July 1970, the Justice Department filed civil suits against 10 plants that the Federal Water Quality Administration considered were not reducing their mercury losses quickly enough.¹⁴ Interim stipulations were entered in 9 of the 10 cases in 1970, pending review (by the successor agency to the Federal Water Quality Administration) of the defendants' plans for further reduction in mercury discharges (45). By the end of the year, the successor agency, the Environmental Protection Agency, estimated that the daily discharge of mercury from known sources was down to about 40 pounds a day, a rate of less than 15,000 pounds a year. It appeared that the American chlorine industry had reduced its mercury discharges into waterways by as much as 98 or 99 percent (46).

Estuaries and Coastal Areas

Before the 1960's, disputes between developers and preservationists concerning water resources had generally centered on the question of whether the natural river or the dammed and channelized river was to be preferred. Local interests frequently favored development, for whatever economic benefit it might bring, and national conservation organizations favored preservation. During the 1960's, there were also many disputes over reservoir or channel projects; some of these will be discussed in the context of water agency construction programs. But, in addition, a new type of preservationist dispute arose that was generally able to muster a great deal of local support. This type of dispute concerned the preservation of estuaries, coastal beaches, and Great Lakes bays and shorelines. It usually involved land use as well as water resource problems. In some cases, it involved the effect of upstream water project construction or harbor and channel dredging activities of the Corps of Engineers on estuarian resources. More typically, it involved filling in marshes by private landowners or pollution, in which case Federal regulatory responsibilities to preserve fish and wildlife or water quality were involved.

¹⁴These suits were not brought under the Federal Water Pollution Control Act, which contained no such rapid enforcement action, but under Section 13 of the Rivers and Harbors Act of 1899. This was an authority administered by the Corps of Engineers which had recently been discovered to provide a new means of enforcing abatement of industrial water pollution. The provisions of the 1899 Act and the extent and manner of its use in 1969 and 1970 will be discussed in chapters 5 and 8.

So many conservationist disputes of the middle and late 1960's concerned estuaries¹⁵ that Congress in 1968 passed an act authorizing a study of estuaries and "estuary-like areas of the Great Lakes" to examine the desirability and feasibility of establishing a nationwide system of estuarine areas (47). The congressional hearings on this legislation reveal that coastal citizens' organizations and political leaders had recently become aware of the destruction of shoreline resources which resulted from filling in of marshes to create real estate, pollution,¹⁶ upriver diversion of fresh water supplies, ditching and draining wetlands, and mining for sand, gravel, phosphates, shell, or fill materials (48). Local citizens' and conservation organizations became involved in political struggles and, at the end of the decade, lawsuits to prevent more such incursions from occurring.

The best known of these struggles concerned San Francisco Bay and delta, an estuary on which 250 (out of an original 300) square miles of marshland had been "reclaimed" and 17 square miles of open water had been dried up between 1850 and 1967 (49). The "Save the Bay" movement in the early 1960's resulted in the creation by the California Legislature of a regional commission with authority to prepare a comprehensive plan for the conservation of the bay and the development of its shoreline and to regulate bay filling and dredging (50).

Nonetheless, a number of disputes concerning the necessity of continuing environmental degradations, and bearing on the environmental responsibilities and deficiencies of Federal programs, continued after the creation of the San Francisco Bay Conservation and Development Commission. These disputes concerned the propriety of the Federal Aviation Administration's financing the building of airports in the bay, the propriety of the Corps of Engineers' granting fill permits for such airports, and the adequacy of the Interior Department's review of such fill permit applications and advice to the Corps concerning effects on fish and wildlife. Also questioned were the propriety of the Corps' disposal of harbor dredging spoil in the

¹⁵Estuaries are the areas at the mouths of rivers where fresh water mingles with and dilutes sea water and is retarded in its flow to the sea by the tides. They typically provide a special environment of bays, harbors, and lagoons, bordered by marshes, wetlands, and dunes. This environment is the breeding ground of many highly valued species of fish and shell fish, the necessary way station of anadromous fish that divide their lives between fresh and salt water, and the habitat of many species of waterfowl and other animals. In addition, estuaries, their shorelines, and nearby coastal beaches provide the only open, wilderness-type areas near large metropolitan centers and many of the most attractive and celebrated vistas of coastal cities.

¹⁶Such pollution resulted from municipal and industrial sewage, land runoff and soil erosion, dumping garbage in coastal marshes, oil spills, disposal of polluted harbor dredging, waste heat, and marine toilets.

bay and its marshes and the adequacy of Federal sewage treatment plant construction funds available to the area (51). There was also "Save the Bay" opposition to two features of the California State water project, which were also part of the Bureau of Reclamation's Central Valley project:

- (1) The proposed San Joaquin master drain which would carry agricultural wastes from the Central Valley to the bay; (52) and
- (2) The proposed peripheral canal, which would divert a large proportion of the high quality Sacramento River from the estuary, thereby decreasing its waste assimilative capacity and increasing its salinity (53).

Another well-publicized estuarial conservation issue involved the Everglades, where the conflict over the interference of flood control structures with the fresh water supply of the national park (described in chapter 3) developed new permutations in the second half of the decade (54). Moreover, additional injury to the Everglades was felt to be threatened by plans to construct a jetport. Some of the other public protests against destruction of estuarine resources in the 1960's concerned disposal of dredging spoil in Chesapeake Bay, filling in of salt marshes for oil refinery and industrial plant construction in Delaware Bay, and mining for shell in the oyster beds of Galveston Bay. In addition, there were protests against dredging and filling wetlands to create residential property in Great South Bay, Long Island, on numerous estuarine sites on both the Atlantic and gulf coasts of Florida, Newport Beach, California, and many other estuaries (55).

A grant of a landfill permit for residential construction at Little Hunting Creek on the Potomac resulted in a congressional committee reprimand for both the Corps and the Interior Department (56). In Boca Ciega Bay, Florida, on the contrary, the denial of such a permit on ecological rather than navigational grounds resulted in a suit against the Corps by the landowner-developer, which was upheld on the district court level (57).

There were also a great many conservationist protests of destruction of the resources of Great Lakes shorelines and embayments in the 1960's. These included the dumping of taconite tailings at Silver Bay on Lake Superior (58) and industrial pollution at Calumet Harbor on southern Lake Michigan (59). Another protest concerned filling marshlands for steel plant construction, near the Indiana Dunes on Lake Michigan, followed by proposals for new landfills for a jet port and a "linear city" (60). (Disposal of polluted harbor dredging spoil in the middle of shallow Lake Erie was a somewhat related activity also strongly protested by public interest groups (61).)

Oil pollution—the Santa Barbara Oil Spill. Oil Pollution from the effluent of oil refineries, located in estuaries, or on rivers feeding into them, and from tankers cleaning their bilges in the harbor was endemic in many estuaries and coastal areas. Spills from tankers and offshore drilling also caused more pollution many times during the decade (62).¹⁷ But the oil pollution episode that aroused the greatest public protest and resulted in the greatest change in Federal policy involved pollution of ocean beaches. This was the 1969 blowout of an oil platform operated by a Federal lessee on the outer continental shelf near Santa Barbara, after the granting of the lease had been strongly opposed by local government and citizens' organizations. The Santa Barbara oil spill created an oil slick of many hundreds of square miles on coastal waters. It also covered 13 miles of ocean frontage with crude oil, thereby killing fish and wildlife, and damaging beaches, the tourist industry, and perhaps most of all, damaging the morale of the area's residents who had prided themselves on the beauty of their community (63).

The Government's response to the Santa Barbara oil spill was prompt and vigorous. Secretary of the Interior Hickel issued regulations tightening control of outer continental shelf drilling and making industry liable for the cleanup of spills (64). Congress passed legislation similarly affecting spills from other offshore facilities, onshore facilities, and ships (65). But the most important effect of the Santa Barbara oil spill was its effect on public opinion, causing fundamental changes in U.S. environmental policy in 1969-70. Thus, former Secretary of the Interior Udall (the official originally responsible for granting the Santa Barbara channel oil leases) testified before a congressional committee that Santa Barbara was "a sort of conservation Bay of Pigs." He stated the lesson to be learned from it was that "we should always err on the side of protection when a mistake can do great damage to other resources" (66).

Major Presidential Policy Initiatives and Congressional Responses

Kennedy Administration—Policies and Politics

In 1960, Presidential candidate John F. Kennedy promised more Federal water development as part of his central campaign promise to "get America moving again." In his Billings, Montana speech in September 1960, the candidate outlined

¹⁷On June 22, 1969, the Cuyahoga River, which flows into Lake Erie, was so grossly polluted near its entrance to the Lake at Cleveland that it burst into flames.

a nine-point natural resources program consisting of numerous Federal ventures in water and power development. Prominent aspects of this program were: reversal of President Eisenhower's "no new starts" policy, rejection of the "partnership principle" in hydro development, building Federal transmission lines, and marketing of Federal power to public power preference customers. The candidate also promised more Federal aid for water pollution control, and programs of research into desalination and other methods to conserve and enhance water supplies (67).

Soon after assuming office, President Kennedy picked up these themes in his message to Congress on natural resources (68). In this message, the President also declared his belief in the Senate select committee's perception that present and projected water supply shortages were threatening economic growth, particularly in the West. He urged that available water be used to give maximum benefits for all purposes, with special attention to M and I water and hydropower. He also announced his intention to act on the Senate select committee's recommendations concerning nationwide comprehensive plans by 1970 and the strengthening and coordination of national water research.

As shortrun Federal policies, President Kennedy recommended an active program of new project starts, speeding up the flood control program, full development of the power and water of the Columbia basin, and reservation of future sites for reservoirs. He also recommended a doubling (to \$100 million a year) of the authorization for sewage treatment plant construction grants, initiation of the Corps flood plain studies program, authorized the previous year, and new emphasis on desalination research.

Kennedy's interest in natural resources was primarily in the economic potential of "scientific" resource development, not, to any large extent, an interest in preserving the environment. Thus, in his remarks to the White House Conference on Conservation in the spring of 1962, he predicted that the most noteworthy contributions of conservationists in the 1960's would probably be: to teach the proven techniques of wise resource use (specifically dam building) to developing nations and to apply new scientific methods such as desalination, ocean farming, and oil shale recovery to increasing the supply of usable natural resources (69).

However, Kennedy's Secretary of the Interior, Stewart Udall, did have a feeling for the importance of resource stewardship as shown in his book, *The Quiet Crisis*, published in 1963. Moreover, the report of the Outdoor Recreation Resources Review Commission (ORRRC) in January 1962 was

enthusiastically adopted by the Kennedy administration. The ORRRC report recommended public acquisition and preservation of beaches, preservation of wild rivers, and sufficient investment in pollution control to protect water recreation (not merely public health) (70). The 1962 annual report of the Secretary of Interior boasted of the President's commitment to the preservation of nature for scenic and recreation purposes. The Secretary's report pointed with pride to the acquisition of three large national seashore areas by the National Park Service as adding more acreage to the system than the total additions of the previous 20 years (71).

But the most important changes in water resources programs initiated by the Kennedy administration and congressional water resources committees during the Kennedy administration (many of which have already been discussed) were more development than preservation oriented. Thus, Senate Document 97 revised standards for benefit-cost analysis in ways that were expected to permit many more projects to be found economically feasible and built. Many new projects were authorized in the Kennedy period, and a great many authorized projects were funded and construction started. These included ambitious engineering projects intended to make substantial alterations in the environment, such as the Reclamation Bureau's Fryingpan-Arkansas transmountain diversion (72) and new canals that would add hundreds of miles to the Nation's inland waterway system (73). In addition, the United States ratified the Columbia River Treaty which provided the basis for the nearly total regulation of the U.S. section of the river for hydropower and flood control (74), and the Bureau of Reclamation prepared the Pacific-Southwest Water Plan involving interregional water transfers and revenue-producing hydroelectric dams in the Colorado Gorge. The desalination program was greatly expanded, and water quality storage became more than an incidental purpose for Federal reservoir construction.

Johnson Administration—Policies and Politics

President Johnson endorsed the Kennedy administration's legislative proposals for coordination of water resources planning and research, allocation of costs to recreation at Federal water projects, creation of a land and water conservation fund, and extension and expansion of the saline water conservation program (75). But it was not until Johnson was elected President in his own right that he made nature preservation an important aspect of his domestic policy, while at the same time continuing to implement the water resources development goals of the Senate select committee.

Caldwell has described the Johnson administration's concern, first for "natural beauty," then "environmental quality," as belonging to a consumer orientation toward nature. With the growth of affluence and geographical mobility, Americans could afford higher levels of dissatisfaction (76). Thus, Johnson, in his 1964 "Great Society" campaign speech, tuned into a national mood when he said that "material progress is only the foundation on which we will build a richer life of mind and spirit." He then went on to state that the preservation of the natural beauty of the countryside¹⁸ was second in priority only to the rebuilding of urban America to include open space and communion with nature (77).

Soon after his inauguration as an elected President, Johnson outlined his "new conservation" policy, calling for a White House Conference on Natural Beauty in a special message to the Congress (78). In this message, Johnson praised the conservationist achievements of the 88th Congress, which he elsewhere defined to include both preservationist and economic development program accomplishments (79). But the measures he now proposed for the attention of the 89th Congress were exclusively concerned with nonmaterial, environmental values. These proposals included urban and highway beautification, Clean Air Act amendments, solid waste and pesticide control legislation, and several measures encouraging the preservation of water resources. These were: the acquisition of land for more national seashores and lakeshores (including the Indiana Dunes), the establishment of a National Wild Rivers System, and new water pollution legislation creating enforceable water quality standards to prevent pollution, rather than attempting to cure it after it occurred.

In addition, President Johnson announced that he was asking the Secretary of the Interior to review the plan of the Corps of Engineers to build dams on the Potomac. (The plan for development of the Potomac which the Corps had made public in 1964 had evoked bitter hostility from Washington area conservationists and citizens' associations, despite its intention to benefit local governments by providing additional municipal water supply and low flow augmentation to reduce pollution. This was because it would also diminish the woodland beauty of the shorelands west of Washington and drown a portion of the historic Chesapeake and Ohio Canal (80).)

Secretary Udall was also asked to lead a team of concerned Federal agencies and State and local governments in preparing a special program for the Potomac. It was to include pollution abatement (to make the river at Washington clean enough so that it

¹⁸Johnson defined this goal to include abatement of water and air pollution.

could be used for fishing, swimming, and water skiing), preservation of the natural beauty of the shoreline, provision of recreation facilities, and completion of the scenic George Washington Memorial Parkway on both sides of the river.

In Johnson's 1965 message on natural beauty, city parks were the first item offered for the consideration of Congress. Creation of national parks and seashores was second, highway beautification third, the special program for the Potomac fourth. Pollution was only sixth. A year later, in his February 1966 *Message to the Congress on the Preservation of America's Natural Heritage* (81), the President's point of view had undergone a significant change. He quoted the report of the environmental pollution panel of the President's Science Advisory Committee to focus attention on pollution (particularly water pollution) as the Nation's most pressing and ecologically costly natural resource problem.

In the Johnson administration's view in February 1966, the solution to pollution was organization. The entire river basin, rather than the locality, should be the focus of pollution control efforts in order to provide efficiencies of size and location in treatment plant operation. The President stated that the 89th Congress had already made a good start in this direction by providing for the establishment of interstate water quality standards and plans for their implementation, and for the creation of the Water Resources Council to coordinate all Federal water resources programs on the river basin level.

Now LBJ proposed a "clean rivers demonstration program." The Federal Government would provide funds (\$50 million for the first year) to a number of interstate and/or regional water pollution control authorities, on a first-ready, first-served basis.

River basins or other regions of connected waters selected for participation in this program would be required to have permanent water quality planning organizations, and water quality standards with implementation plans in force for all waters of the basin. According to S2987, the administration bill submitted with this message, these planning organizations could be State-Federal river basin commissions established as provided in title II of the Water Resources Planning Act of 1965. All planning organizations would be required to study the applicability of imposing effluent charges on public and private waste dischargers. Communities would be required to be willing and able to contribute their share of construction funds, levy adequate sewage system user charges, and employ a metering system to conserve water.

The Federal Government would then make initial construction grants of up to 30 percent of construction costs to build all the sewage treatment facilities called for in the plan, including area-wide facilities. For the demonstration program,

the Government would be authorized to disregard the regular construction grant program's dollar ceilings on individual projects and its formulas for allocating grant funds among the States on the basis of population and income. After initial Federal assistance, however, the river basin organizations would be required to provide for the collection of sufficient revenues through bond issues or user charges to pay for all subsequent operations, expansion, and replacement.

In addition, LBJ announced that he was planning to shift the new Federal Water Pollution Control Administration from HEW to Interior to facilitate Federal level coordination between water development and water pollution programs, since the Secretary of the Interior was also chairman of the Water Resources Council. He also pointed to the then current Northeast urban water shortages as evidence of a continuing need to solve the Nation's water supply problems. And he recommended that the Congress enact legislation creating a National Water Commission to review and make recommendations on the entire range of water resources problems. President Johnson did not recommend, at this time, that the regular sewage treatment facility construction grant program be extended (it was scheduled to expire after 1967) or increased beyond the \$150-million-a-year level authorized in 1965. But he did propose measures to strengthen Federal pollution abatement enforcement powers.

The Senate Subcommittee on Air and Water Pollution had also reached the opinion (on the basis of its own investigations and the projections of the committee on pollution of the National Academy of Sciences) that water pollution was a growing problem inadequately dealt with by existing legislation (82). But the congressional solution to pollution in 1966 was money. Senate committee hearings on proposed water pollution legislation in 1966 reveal that congressional leaders believed that the State rather than the river basin was the appropriate focus for water pollution abatement campaigns. Moreover, congressional leaders considered that the States were ready to begin a massive nationwide treatment plant construction program which could not wait on the slow establishment of demonstration river basin programs. They believed instead that much larger and longer continuing Federal investments would be required (83).

In the summer of 1966, the Administration responded to the congressional point of view by producing a revised administration request, which extended and greatly increased the regular construction grant program. It also increased Federal support to 50 percent in the demonstration rivers construction program (84). But the Clean Rivers Restoration Act of 1966, as enacted into law, was mainly based on the bill prepared by the Senate subcommittees (85). It contained no

demonstration river basins but paid its respects to the river basin planning concept in two ways: (1) it authorized grants to State and interstate agencies for basin planning; and (2) it raised Federal treatment facility grants, from 30 to 50 percent of estimated construction costs, in cases where the State agreed both to contribute to the construction costs and to set enforceable water quality standards for the waters (including intra-state waters) into which the treatment facilities discharged.¹⁹

However, the greatest effect of the 1966 act on the construction grant program was to greatly increase the funds that could be appropriated for it. The dollar ceilings on individual construction grants, which had meant that most of the Federal money hitherto spent on treatment plant construction was spent on small plants in small communities, were entirely eliminated. The yearly amounts authorized to be appropriated, which (until the 1965 Act raised them to \$150 million a year for fiscal years 1966 and 1967) had been only \$100 million a year, were raised to \$450 million in fiscal 1968, \$700 million in fiscal 1969, \$1 billion in fiscal 1970, and \$1.25 billion in fiscal 1971. Full funding of the construction grant program had always previously been requested by the Kennedy-Johnson administrations and granted by the HEW Subcommittee of the House and Senate Appropriations Committees.²⁰ Hence, it appeared that by the end of the decade the Government would be spending about as much on the program of the Federal Water Pollution Control Administration as it was on the program of the Corps of Engineers. President Johnson, in signing the Clean Waters Restoration Act in November 1966, said that he considered it well designed to facilitate solution of the Nation's water pollution problems on the basis of entire river basins (86).

However, the construction grant program was not funded at the levels authorized in the Clean Waters Restoration Act during the Johnson administration. The construction grant program was one of many domestic programs cut back in the last 2 years of that administration because of increasing financial requirements of the American commitment in Vietnam. Thus, in 1967, the Johnson administration asked for and

¹⁹The addition of this provision to a provision of the Water Quality Act of 1965, which increased grants for projects conforming to metropolitan area plans, meant that in metropolitan areas the Federal contribution could now be 55 percent.

²⁰In 1967, after the Federal Water Pollution Administration was transferred to the Department of Interior, responsibility for its appropriations was transferred to the Public Works Appropriations Subcommittee, which was also responsible for appropriations of the Corps of Engineers and the Bureau of Reclamation.

received only \$203 million for fiscal 1968 (87).²¹

The Secretary of Interior in 1967 gave assurances to congressional clean rivers restoration enthusiasts that the low level of first-year budgeting for the program did not mean that the administration had abandoned it but rather that time was needed to put it into effect. Most States would be unprepared to participate during the first year since they would still be preparing their water quality standards and implementation plans. He stated that the few States and localities that were ready to participate could be serviced from carry-over funds (88). But in 1968, the Johnson administration asked for only \$225 million for fiscal 1969, although the authorized funding level had risen to \$700 million, and the House Appropriations Subcommittee, in view of what it considered a "critical budget situation," refused to appropriate more than \$214 million (89).

In the last 2 years of the Johnson administration, the two public works appropriations subcommittees were still inclined to think of the sewage treatment plant construction grant program as just one of many programs of meritorious works of local improvement. They believed that water pollution control was obliged to share equitably with programs for flood control, navigation, irrigation, and drainage in budgetary constraints imposed by more important national concerns, such as defense. But other Congressmen and congressional committees did not agree. The new congressional "environmental bloc" was more responsive than either the appropriations subcommittees or the executive branch to the growing feeling of the public that reversing the degradation of the environment was a matter of highest national priority. As a result, about 20 bills were introduced in the 90th Congress to deal with the concept of the environment as a whole, rather than with individual natural resource problems. These bills attempted to provide administrative means for making overall environmental policy and for keeping the executive branch and Congress informed about the ecological effects of environment-shaping public and private actions. The "environmental policy" bills of the 90th Congress were primarily intended to generate public discussion

²¹The large public works programs of the Corps of Engineers and Bureau of Reclamation were among the other programs cut back, as were virtually all other water resources programs. Since the level of funding reduction that is practical for construction already underway is limited, the best measure of the cutback in the programs of the Corps and Bureau is probably shown by the number of new project starts included in the appropriation act. In 1966, when funding was increasing not only for the military budget but for such domestic programs as "the war on poverty," President Johnson asked for only 29 new construction starts, a significantly smaller number than had been requested earlier in the Kennedy-Johnson administrations. But congress authorized 63. In 1967, the President asked for only 7 new starts, but received 36. However, in 1968, Johnson asked for and received only 11 new starts.

about the environment. They became the subject of extensive hearings and committee reports (90). In addition, a joint colloquium on a National Policy for the Environment, under the sponsorship of the Senate Committee on Interior and Insular Affairs and the House Committee on Science and Astronautics, resulted in a congressional white paper on the subject (91).

Nixon Administration—Policies and Politics

However, none of this congressional activity had any influence on the presidential election campaign of 1968. Natural resources development had been raised as a minor campaign issue by the Democrats in 1960 and preservation of natural beauty as a somewhat more important issue in 1964. In 1968, with national attention focused on the Vietnam war, the effectiveness of various anti-poverty measures, student unrest, urban riots, and "crime in the streets," scarcely any mention was made of any natural resource issue by either party. But after the election of President Nixon, it soon became apparent that protection of the environment was an issue with strong and wide public support and one that had perhaps unique capability to "bring us together again," as candidate Nixon had promised.

The intensity of public feeling against degradation of the environment was first revealed to the Nixon administration immediately after the inauguration, when the President nominated Walter J. Hickel, former Governor of Alaska, to be Secretary of Interior. Hickel was widely believed to be an uninhibited developmentalist, whereas his predecessor, Stewart Udall, had the reputation of a protector of the environment. As a result, a flood of protesting letters descended on Congress and the new administration, and protesting editorials, cartoons, and comment appeared in the mass media. Mr. Hickel was one of the very few presidential nominees whose appointment was the subject of extended and widely publicized hearings; he was confirmed only after he assured the Senate Committee on Insular and Interior Affairs that he was a conservationist (92). He was soon given the opportunity to prove the truth of this assurance. The Santa Barbara oil spill occurred within a month of his confirmation. By the end of the following month, Secretary Hickel had become a hero to environmentalists by halting all drilling off Santa Barbara, pending the issuance of more stringent drilling regulations, and by amending the Federal outer continental shelf regulations to hold oil companies absolutely liable for the cost of cleaning up their own spills (93).

The Nixon administration thus began its term of office with good conservationist credentials. But at first, its enthusiasm for environmental action was circumscribed, as the Johnson administration's had been, by budgetary considerations. In

1969, U.S. financial commitments in Vietnam were still very large, and the new administration proposed to check inflation by cutting domestic spending in fiscal 1970 (94). But Congress prodded the President to take action in the two areas of water pollution control and national environmental policy. Congress, in turn, was prodded by the organized environmental movement (which by 1969, could hardly be ignored when it claimed to represent the will of the people) into taking unprecedentedly strong environmental actions (95).²² In 1970, the Nixon administration produced, on its own initiative, still more fundamental changes.

In the case of the sewage treatment facility construction grant program, there is no question that the prime factor in achieving a great increase in funding for fiscal 1970 was organized public pressure. President Nixon's budget originally called for only the \$214 million that had been recommended by the outgoing Johnson administration. But in June of 1969, the Citizens' Crusade for Clean Water, a coalition of groups favoring pollution control, was formed to organize support for appropriation of the full \$1 billion authorized by the Clean Water Restoration Act for 1970. This was only slightly less than the entire amount the Federal Government had spent on the construction grant program since its inception in 1956.

The Citizens' Crusade for Clean Water consisted originally of two dozen groups including leading conservation organizations, citizens' organizations, municipal and county government associations, labor unions, and professional societies. It began its campaign by marshalling a very impressive delegation of witnesses (including representatives of State and local governments, a State Governor, and Senators) to testify at the Senate Appropriations Committee hearings. It then circulated a petition for full funding of the construction grant program and obtained the signature of 225 members of the House of Representatives from both parties (96).

The House Committee on Appropriations then reported its recommendation for \$600 million. The Senate committee went further and recommended appropriation of the full \$1 billion. At this point, the White House offered a compromise of \$750 million, but the \$800 million agreed on by the House-Senate conference committee became law (97).

By the beginning of 1970, President Nixon had been convinced of the need for massive Federal investments in the

²²In February 1969, the National Wildlife Federation sponsored a Gallup poll which found that 86 percent of the public was worried about the environment and that 75 percent would be willing to pay more taxes for environmental improvements.

sewage treatment plant construction program (98).²³ In his February 10, 1970 *Message on Environmental Quality* (99), the President based his water pollution control funding proposals on the annual report of the Federal Water Pollution Control Administration's economists on the needs and costs of nationwide water pollution abatement. This report, *The Economics of Clean Water 1970*, was the third economic report authorized by the Clean Water Restoration Act of 1966. (The first report in 1968 had also made recommendations for Federal funding but had not been used as the basis of budget requests.)

In his February 1970 message, President Nixon proposed a 4-year, 10-billion-dollar program of Federal, State, and local investment in treatment facilities. The Federal share of this investment was to be \$1 billion a year, which was still \$250 million less than the authorization for fiscal 1971 under the Clean Water Restoration Act. It was also considerably lower than the funding level wanted by leading congressional proponents of water pollution control. (S3687, the bill introduced by Senator Muskie in April 1970, called for \$2.5 billion a year over a 5-year period.) However, it was much closer to the authorized level and much higher than any previous presidential request.

In the same message, the President also proposed a program of measures to make this investment more effective. The President's proposals for new legislation included:

- (1) Creation of an Environmental Financing Authority to enable communities to sell bonds to finance their share of construction costs.
- (2) Revision of the formula for allocating treatment plant construction grant funds so special emphasis could be given to areas where facilities are most needed and where the greatest improvements in water quality would result.
- (3) Extension of Federal water pollution control jurisdiction to all navigable surface waters and to interstate ground waters.

²³This new attitude did not apply to Federal spending on water development, however. By 1970, President Nixon no longer felt that it was necessary for budgetary purposes to cut the annual appropriation for continuing work on Corps of Engineers and Bureau of Reclamation projects. But he was unable to see any national purpose in continuing to expand them. In signing the Public Works Appropriation Act (PL 91-439) on October 7, 1970, the President observed that he felt compelled to do so because the act contained funds for many important purposes and projects that must be carried forward (including the Federal Water Quality Administration, AEC, TVA, and the Interior Department power marketing agencies). However, the President had requested only 37 new project starts for the Corps and the Bureau. Congress had increased this number to 102, which would ultimately cost the taxpayers an additional \$3.2 billion. The President commented that "many of these added starts are for projects which would benefit some particularly interested group but would be of little value to the people generally. There is too much pork in this barrel."

- (4) Amendment of all Federal-State water quality standards to impose precise effluent standards on all industrial and municipal sources. (Violation of such effluent standards would be sufficient cause for court action.)
- (5) Revision of Federal enforcement procedures to allow the Secretary of Interior to proceed more swiftly and with more effective legal weapons, including, in sufficiently urgent situations, injunctions.
- (6) Provision that violators of water quality standards be subject to court-imposed fines of up to \$10,000 a day.

The full response of Congress to President Nixon's 1970 legislative initiative was not to be felt until the passage of new water pollution control legislation 2 years later. But at the same time that he made his legislative proposals, the President announced that he was instructing the Secretary of Interior to immediately institute the following administrative reforms in the water pollution control program.

- (1) Henceforth, federally assisted treatment plants would be required to meet prescribed design, operation, and maintenance standards and to be operated by State-certified operators only.
- (2) Municipalities receiving Federal assistance would be required to impose sufficient fees on industrial users to meet the costs of treating industrial wastes.
- (3) States requesting construction grants would be required to develop river basin pollution control plans and new federally supported treatment plants would be required to be consistent with such plans.
- (4) Communities would be strongly encouraged to cooperate in the construction of large regional facilities in order to provide economies of scale and give more efficient and thorough waste treatment.²⁴

In early 1969, Congress followed its own initiative, rather than the President's, in developing overall national environmental policy. Congressional environmental leaders boiled down the multitude of legislative proposals concerning environmental policies of the 90th Congress to a smaller number containing provisions for a declaration of Federal policy to protect the environment, studies of ecological systems, studies of environmental impacts of proposed resource developments, and an environmental advisory council in the Executive Office of the President (100). Congressional and conservation

²⁴All these reforms were either already recommended by the General Accounting Office (GAO) or were under investigation by the GAO at the request of Congress. The findings of GAO investigations of the Federal water pollution control program in 1967-70 will be discussed later in chapter 8 of this history.

organization support for an enactment with these features had become very strong. Committee hearings on this legislation were scheduled for the spring, and it appeared likely that a national environmental policy statute would be passed by the 91st Congress.

In the meantime, President Nixon developed his own centralized and coordinated environmental program. Immediately following his election, he had appointed a task force on resources and the environment under the leadership of Russell Train, president of the Conservation Foundation. The task force recommended that environmental protection be made a matter of highest national priority. It also recommended that the President appoint a special assistant for environmental affairs to advise him and serve as staff for a cabinet-level interdepartmental council on environmental quality, similar to President Johnson's Council on Recreation and Natural Beauty, but with more responsibilities (101). The President rejected the concept of a new special advisor in his Executive Office after his inauguration but instructed the Office of Science and Technology (OST) to draft an Executive order creating a cabinet-level interagency committee (102).

On May 29, 1969, Executive Order 11472 established the Cabinet Committee on the Environment to advise and assist the President on environmental quality matters, including measures to ensure that Federal natural resource programs take adequate account of environmental effects. The President himself was the chairman of this group. The Vice President and the Secretaries of Agriculture, Commerce, HEW, HUD, Interior, and Transportation, "and such other heads of departments and agencies as the President might from time to time direct," were its members. The President's science advisor was its executive director and the OST was its staff.

The President's chairmanship of this group and its White House staffing appeared to ensure that the new committee would have more input into overall administration policy and receive more attention from its cabinet officer members than the Water Resources Council, for example, had. Nonetheless, proponents of a national environmental policy statute were not satisfied that the Cabinet committee device would be adequate for their purposes. They doubted whether an interdepartmental committee, representing agencies with missions other than environmental protection, could provide impartial advice (103). They also doubted that the overburdened Cabinet officers and science advisor could give the committee sufficient attention and that OST had enough personnel to adequately perform the committee's staff work, in addition to its other responsibilities (104).

In addition, congressional leaders wanted a statement of national environmental policy that would be binding on all government agencies. They became convinced, in the course of deliberations and hearings, that such a national policy statement must be accompanied by "action-forcing" provisions in order to have more than rhetorical effect (105).

Executive branch witnesses did not object to the provisions of the congressional committee bills, except that some of them said that the Council on Environmental Quality they would create would duplicate some of the functions of the Cabinet committee (106).

The National Environmental Policy Act of 1969 (NEPA) (107) was passed by both houses of Congress at the end of the year and signed into law on January 1, 1970. In signing the Act, the President enthusiastically praised it, predicting that the three-member Council on Environmental Quality (CEQ) and the small staff it created would function in the same way as the Council of Economic Advisors had functioned in informing the President on problems and advising on policy. He also stated that the duties of the Cabinet Committee on the Environment would be rearranged so as not to duplicate the functions of CEQ. (The Cabinet committee was terminated by Executive Order 11541 on July 1, 1970).

President Nixon also questioned the desirability of creating an additional Office of Environmental Quality to staff CEQ (108), as proposed in the pending Water Quality Improvement Act (109).²⁵

The provisions of the NEPA will later be discussed in the context of the agency programs they affected. In this chapter, which concerns the interaction of presidential and congressional policy initiatives and public opinion, it is probably sufficient to make two observations about the changes brought about by the act:

- (1) CEQ's capability to provide a long-range environmental overview and identification of environmental problems as a basis for presidential directives and legislative proposals was immediately obvious to the Congress, the President, and the press.
- (2) By contrast, the landmark significance of the "action-forcing" provisions of the NEPA, particularly section

²⁵When the Water Quality Improvement Act, including the Office of Environmental Quality provision, passed in April 1970, the President signed it without complaining that Congress was giving CEQ too much staff. He had already, on February 10, assigned CEQ responsibility for developing an attack on agricultural water pollution and was at the point of proposing legislation giving it additional responsibilities involving controlling dumping of dredging spoil into the Great Lakes and developing a program to regulate ocean dumping.

102(2)(c), which provided that all Federal agencies must submit an "environmental impact statement" with all reports recommending major actions affecting the environment, was less fully appreciated at the time of the passage of the act (110). It was better understood very shortly afterward, however, when its first effects on Federal programs involving water resources projects, transportation, and public lands began to be seen.

The Nixon administration was very prompt in putting the action-forcing provisions of the NEPA into effect. On March 5, 1970, the President issued Executive Order 11514 instructing all Federal agencies to report on possible divergencies of their enabling authorities, policies, and procedures with the NEPA's purposes. On April 30, 1970, CEQ issued interim guidelines for the preparation of environmental statements, requiring all Federal agencies to establish internal procedures for their preparation by June 1, 1970.

The third major policy change affecting water programs of the first 2 years of the Nixon administration was not, in any way, incited by the Congress but was initiated and carried out by President Nixon on the basis of recommendations by the President's Advisory Council on Executive Organization (the Ash Council). This was the establishment of a new independent agency, the Environmental Protection Agency (EPA), under Reorganization Plan No. 3, which took effect, with the acquiescence of Congress, in December 1970. EPA was created out of programs and units previously scattered among USDA, HEW, Interior, and the Atomic Energy Commission. It brought together, in one agency, pollution control programs concerning water, air, solid wastes, pesticides, and radiation.

The administration justified creation of this new agency on the grounds that the environment must be perceived as a single, interrelated system. (The President pointed out that a single source, such as a factory, might be able to dispose of contaminating wastes interchangeably in land, water, or air, and some pollutants, such as mercury or pesticides, could be found in all media (111).) Although a few minor quibbles were raised, Congress and the conservation organizations generally agreed with this approach (112). The separation of water pollution control from other water programs seemed to conform to the public feeling that had been growing during the late 1960's that water resources development and water pollution control were at best unrelated, and at worst antagonistic, concerns.

Yet, only 4 years previously, President Johnson had transferred the Federal Water Pollution Control Administration from HEW to Interior on the specific grounds that Interior was already responsible for water resources programs concerning

irrigation, water power, desalination, fish and wildlife protection, recreation planning, and water research. President Johnson had also pointed out that the Secretary of Interior was chairman of the Water Resources Council, which was responsible for overall policy advice on water and for interagency coordination among water programs.

Since EPA was created at the conclusion of the period, no comment can be made on the effectiveness of EPA's work or the effect of its creation on the subsequent work of other agencies. But it does seem appropriate to comment on what appeared to be its significance as a rejection of the organization of responsibilities that preceded it. Water pollution control had been previously classified as a program having common concerns with programs for controlling flood waters and collecting water supplies for various consumptive and nonconsumptive purposes for two reasons:

- (1) Belief in the capability of interagency river basin planning to produce schemes that, when put into effect, would result in optimum benefits in both pollution control and development of water supplies for various useful purposes.
- (2) Belief that water pollution control programs and water conservation and development programs had the same basic aim—providing water supplies of adequate quantity and quality for various uses.

The removal of the Federal water quality agency from the Department of Interior and from full membership status on the Water Resources Council can be viewed, at least in part, as a rejection of these two concepts.

The events of the 1960's had certainly not lessened the belief of executive branch policymakers and congressional leaders that river basin planning was necessary to effect pollution control. Indeed, the influential 1969 report of the General Accounting Office on the effectiveness of the construction grant program stated that inadequate river basin planning was the chief reason for the comparative ineffectiveness of the program (113). But the improved river basin planning that the GAO recommended was federally funded State planning that would assign construction priorities to proposed treatment plants on the basis of the amount of actual pollution abatement by such plants and the coordinating actions that would be taken by other polluters on the same waterway. It was not to any significant extent the coordinated planning of sewage treatment plants and reservoir storage for low-flow augmentation

that had been foreseen by the Senate select committee in 1961 (114).²⁶

During the 1960's, popular books and magazine articles kept the public rather better informed than might be expected about proposed means other than sewage treatment to accomplish water pollution abatement. The environmental movement drummed up considerable public support for: banning the manufacture or release into sewage of substances such as phosphates in detergents or toxic chemicals; discontinuing dumping polluted harbor dredging spoil into the Great Lakes and coastal estuaries; controlling acid drainage from mines into waterways; providing (by local ordinance) that suburban builders install farm-type soil conservation measures to prevent sedimentation into waterways; and providing that sewage not be discharged into waterways at all, but used to irrigate farmlands (115). But these were devices that had not, traditionally, been included in interagency river basin plans. Water quality storage in multiple-purpose reservoirs, on the other hand, was included in many such plans but received little support from environmentalists. Indeed, the environmental movement was actively opposed to flow-regulation projects, such as the proposed Potomac dams and the proposed Oakley project near Decatur, Illinois, which would have flooded out a 1,500-acre nature area maintained by the University of Illinois (116).

The concept of pollution control as guarantor of water supply for specific purposes requiring high-quality water was necessary for water quality planning, no less than for overall water supply planning. (It was incorporated in the State-Federal water quality standards required by the Water Quality Act of 1965.) But this concept was based on a market approach to environmental quality, which was not a politically popular organizing concept for the Federal water pollution control program, in the ecological mood of 1970. For the purpose of the main task to be accomplished then, it was perhaps not even a very useful concept.

In 1970, environmentalist critics of Government programs and executive branch officials with environmental protection responsibilities were in surprising agreement that the actual abatement of existing water pollution that had been accomplished in the preceding 10 years had been negligible. Both they and congressional water pollution control leaders perceived that the water pollution situation was critical in parts of the

²⁶Although the GAO report found that Federal Water Pollution Control Administration participation in interagency river basin planning had virtually no input into the construction grant program, this did not mean, as we shall see, that it provided no input into the programs of the water development agencies.

Great Lakes, rivers feeding into them, and fragile estuarial and coastal ecosystems; that nationwide water pollution was at an alltime high; and that the Federal water pollution control effort had only been effective in keeping these situations from getting any worse than they were (117). Thus, the first annual report of the CEQ in August 1970 could point only to Lake Washington in Seattle and to San Diego Bay, California, as places where pollution abatement had been very successful (118). Whereas the Biological Oxygen Demand (BOD) of all wastes discharged into receiving waters had gone up only slightly during the 1960's, as a result of improved sewage treatment, the overall quality of the Nation's waters had deteriorated considerably. Reasons for lower quality included: accelerated eutrophication, increased discharges of nonbiodegradable chemicals and metals, greater sediment loadings, and increased discharges of salts (119).

In this circumstance, it seemed pointless for the Government to devote much of its resources to balancing the value of clean water uses against other water use values. Although the optimum level of pollution abatement on a nationwide basis was not agreed on, there was agreement on the location and unacceptability of the worst pollution situations and the fact that previous efforts to deal with them had been largely ineffective. What seemed to be needed in 1970, in addition to more Federal funds, was sufficient resolution and adequate administrative machinery to quickly abate those worst water pollution situations, in some cases before they became irreversible. Perhaps an organization whose only mission was to protect the environment would be able to bring to this task a greater sense of urgency than one that also had missions to develop water resources.

PART III. WATER RESOURCES AGENCY PROGRAMS, 1966-70

5. THE CORPS OF ENGINEERS

The civil works program of the Corps of Engineers entered the second half of the decade in a strengthened position. Annual appropriations, which had been about \$800 million in the last 2 years of the Eisenhower administration, reached \$1 billion in fiscal 1963, \$1.25 billion in fiscal 1965, and \$1.3 billion in fiscal 1966 (see table 2).

At this point, however, appropriations remained relatively unchanged for the next 5 fiscal years, despite marked increases in the total Federal budget, construction, land acquisition, and all other program costs. Thus, the period 1966-70 could be viewed as years of relative program decline. But they were years of diminution only in the construction activities of the Corps. The Corps' less costly activities—project operation, waterways, regulation, research, and planning—expanded at an unprecedented rate (1).¹

The most significant reason for the relative decline of the Corps construction program until about 1969 was budgetary constraint imposed by financial necessities of the Vietnam war. Spokesmen for the Corps and congressional public works appropriations and authorizations committees considered this budgetary constraint to have unfortunate, but temporary, effects on needed regional industrial development. They believed that the Senate select committee report had stated a national policy to increase construction of water projects to meet the expanding water needs of industry, agriculture, and increasing population (2). Furthermore, they considered that this view was sustained by the Water Resources Council's first assessment of the Nation's water resources in 1968 (3). (The first national assessment projected large future increases in waterways traffic, annual flood damages, and demands for new urban water supplies, water based recreation, and shore and riverbank protection.)

¹Because of the much greater cost of construction, compared, for example, to planning, construction continued to absorb most of the Corps funding. Thus, in fiscal 1966, construction accounted for \$1.05 billion of the Corps \$1.3 billion appropriation. In fiscal 1971, with the same appropriation, the construction share was still over \$900 million. A better measure of the growth of importance of nonconstruction elements of the program throughout the period can be seen in the continuing increase in personnel assigned to these elements.

Table 2. Highlights—Corps of Engineers appropriations for water resources development, fiscal years 1959-71.

| Item | Year | | | | | | |
|--|------------------------|-------|-------|-------|-------|-------|-------|
| | 1959 | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 |
| | <i>Million dollars</i> | | | | | | |
| New work | | | | | | | |
| Navigation | 150 | 209 | 211 | 204 | 204 | 216 | 274 |
| Flood control | 278 | 286 | 286 | 325 | 353 | 387 | 453 |
| Flood control, Mississippi River and tributaries | (52) | (52) | (55) | (55) | (53) | (54) | (52) |
| Multiple-purpose, including power | 100 | 215 | 258 | 237 | 266 | 259 | 266 |
| Beach erosion control | 1 | 1 | 1 | 1 | 2 | 1 | 3 |
| All new work. | 659 | 711 | 756 | 767 | 825 | 863 | 996 |
| Other work | 157 | 162 | 180 | 208 | 221 | 234 | 258 |
| TOTAL | 816 | 873 | 936 | 975 | 1,046 | 1,097 | 1,254 |
| | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | |
| New work | | | | | | | |
| Navigation | 306 | 280 | 275 | 210 | 190 | 185 | |
| Flood control | 419 | 419 | 424 | 408 | 340 | 419 | |
| Flood control, Mississippi River and tributaries | (57) | (58) | (59) | (41) | (50) | (53) | |
| Multiple-purpose including power | 323 | 323 | 324 | 304 | 247 | 297 | |
| Beach erosion control | 3 | 2 | 2 | 1 | 5 | 1 | |
| All new work. | 1,051 | 1,024 | 1,025 | 932 | 791 | 902 | |
| Other work | 279 | 269 | 280 | 314 | 366 | 408 | |
| TOTAL | 1,330 | 1,293 | 1,305 | 1,246 | 1,157 | 1,310 | |

Source: Volume I, Annual Reports of the Chief of Engineers for 1965 and 1971.

However, other points of view called for curtailing construction of navigation, flood control, and multiple-purpose water projects. By the first 2 years of the Nixon administration, these other influences were having substantial effects on the Corps construction program. They included effective environmentalist protests against numerous individual Corps projects, and the increase in the discount rate.

Environmentalist Protests Against Corps Projects

Scholarly critics of Federal water programs had recommended in the mid-60's that environmental (and other nonstructural) viewpoints be incorporated into water planning from the beginning. They asserted that this was necessary to prevent the irrational limitation of water management choices that were made available to the public in situations like that on the Potomac and the Colorado. They pointed out that, on the Potomac, the Corps disregarded widespread public support for shoreline preservation until it completed its river basin plan. On the Colorado, the Bureau of Reclamation had ignored public sentiments for preservation of the Grand Canyon until pressure was brought to bear during the authorization act hearing (4).

By the height of the environmental movement in 1969, and especially in 1970, after the passage of the National Environmental Policy Act (NEPA), the Corps was giving substantial consideration to environmental viewpoints in all of its river basin and project plans. But at the same time, numerous Corps projects that had been authorized in omnibus authorization acts in previous years (after having been planned in river basin surveys many years before that) were encountering strong opposition. These projects were being postponed or abandoned at the time they came up for appropriations (see table 3) or even after construction had started (5).² This was partly because of changes in public attitudes, administrative policies, and legislation that took place during the long time lag between project planning and construction in the Corps civil works program (see figure 1). It was also partly because of the development (especially after passage of the NEPA) of the new environmental movement tool of public interest group litigation against Government officials charged with not performing their duties.

²A somewhat extreme case was the Cross-Florida Barge Canal which would have completed navigation linkage between the Atlantic Intracoastal Waterway and the Gulf of Mexico. This project was originally authorized in 1942 but was

(Continued)

Table 3. Trend in Corps of Engineers backlog of authorized civil works projects, fiscal years 1962-71¹

| Fiscal year | Active projects unfunded for construction ² | Cost |
|----------------|--|------------------------|
| | <i>Number</i> | <i>Million dollars</i> |
| 1962 | 245 | 2,332 |
| 1963 | 279 | 3,941 |
| 1964 | 273 | 3,468 |
| 1965 | 377 | 5,198 |
| 1966 | 312 | 4,854 |
| 1967 | 399 | 6,519 |
| 1968 | 388 | 7,614 |
| 1969 | 361 | 7,198 |
| 1970 | 452 | 9,670 |
| 1971 | 408 | 9,675 |

¹ Excludes Mississippi River and tributaries projects (i.e., valley of Mississippi). ² The projects authorized in various omnibus acts are reflected in the unfunded project figures for the following fiscal years.

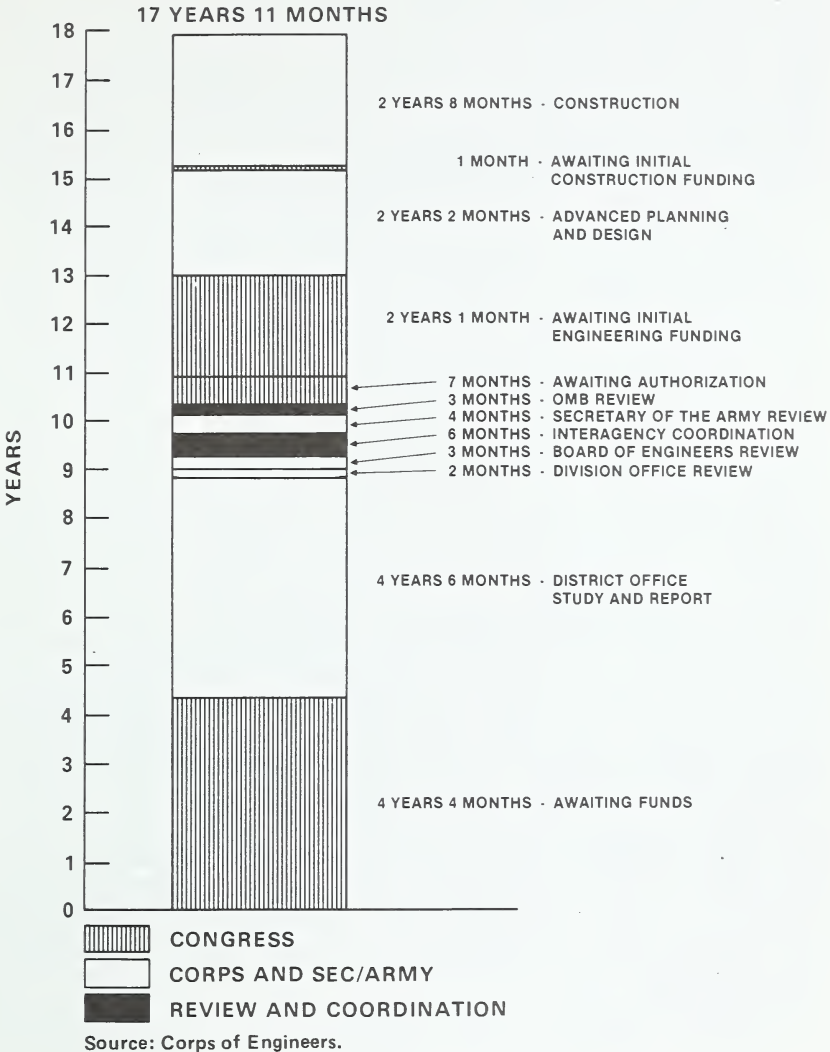
Source: Red Tape—Inquiring into Delays and Excessive Paperwork in Administration of Public Works Program: Hearings before the House Com. on Pub. Works, 92nd Cong., 1st Sess., June 1971, p. 323.

It was also partly due to changes in the composition of the environmental movement. Until this time, preservationists had mostly been outdoor hobbyists. But in 1969 and 1970 alliances were made with biologists, economists, engineers, and lawyers attached to local and State universities, who were willing in many instances to offer their professional services without pay. In other cases, funds were raised to pay for professional services

(Continued)

not started for many years because it was not found to have an unequivocally favorable benefit-cost ratio until 1962, when flood damage reduction and land enhancement benefits were added. Construction was begun in 1964, to very little environmentalist opposition, despite the fact that the Departments of Agriculture and Interior had recently recommended that the Oklawaha River, which would be canalized by the project, be preserved as a wild river. Opposition grew rapidly after construction started, however. By 1970, environmentalist opposition had culminated in: a massive, locally based lobbying campaign; publication of a book containing scientific studies showing the adverse environmental impact of the project; and a "citizens' action" suit to permanently enjoin construction of the canal on the grounds that it violated the terms of its authorization act, the NEPA, and the Fish and Wildlife Coordination Act. In addition, the Secretary of Interior had made a report recommending a 15-month moratorium on construction to permit study by an Interior Department task force. When the project was cancelled by President Nixon in January 1971, on the recommendation of the Council on Environmental Quality, it was one-third completed.

Figure 1. Corps of Engineers analysis of average time for planning and construction of civil works projects (May 1971 status)



used to oppose projects (6). Earlier canal or dam versus wild river controversies had frequently found all the vocal elements of the project district lined up for development, in opposition to national conservation organizations whose members lived many miles away. Now local conservation groups and chapters of national organizations sprang up all around the country threatening the political support of projects such as the Oakley Dam, the Salem Church Dam, and the Lukfata Dam that had formerly been locally noncontroversial (7).

Furthermore, before the passage of the NEPA, the principal formal check on the environmental impact of all Corps projects had been the obligation of the Corps to submit project authorization proposals for review by the Interior Department agencies with fish and wildlife protection and outdoor recreation missions, as well as these agencies' State counterparts. The conclusions of Allee and Ingram, drawn from interviews with persons familiar with the project review programs of the Bureau of Sports Fisheries and Wildlife and the Bureau of Outdoor Recreation (BOR), was that hitherto these agencies had generally been willing to compromise their differences with construction agencies. They had been willing to bargain for "mitigation," in the form of recreation areas, fish ladders and hatcheries, and wildlife sanctuaries, rather than oppose construction of projects that would damage natural scenic areas and habitats (8). However, in 1969 and 1970, Secretary of the Interior Hickel instructed these agencies to restudy some of the Corps more controversial authorized projects to see whether or not they should openly oppose them. And, in the case of the Salem Church Dam on the Rappahannock, for example, the BOR then recommended that the project area be preserved for inclusion in the wild and scenic rivers system (9).

After passage of the NEPA in January 1970 and issuance of Executive Order 11514 (which delineated the responsibilities of Federal agencies) in March, the Corps itself undertook responsibility for fully assessing and justifying the environmental impact of all its projects. During 1970, the Corps prepared 5-point environmental impact statements³ for all the projects that were up for authorization in the omnibus rivers and harbors and flood control bill and circulated them for comment among designated Federal, State, and local agencies (10). It was not at first clear, however, that the NEPA required environmental impact statements for continuation of projects that had already been started (11).

In April 1970, the Chief of Engineers established an environmental advisory board composed of leading members of

³Section 102(2)(c) of the NEPA required all Federal agencies to make a detailed 5-point statement on all proposals for "major Federal actions significantly affecting the quality of the human environment." The five points to be covered were:

- (1) the environmental impact of the proposed action;
- (2) any adverse environmental effects which cannot be avoided should the proposal be implemented;
- (3) alternatives to the proposed action;
- (4) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and
- (5) any irreversible and ir retrievable commitments of resources which would be involved in the proposed action should it be implemented.

the conservationist community. This board was empowered to assist the Corps in meeting its responsibilities under the NEPA by providing advice on projects, as well as plans, programs, and policies (12), but it was not given a veto on any agency environmental action. In its first year the board recommended environmental restudy of the Cross-Florida Barge Canal and the Oakley Project which strengthened the environmentalist case against these projects, although the Corps did not comply with these recommendations (13).

In September 1970, the Corps sent a circular to all its offices concerning the purposes and conduct of "public meetings" on all Corps projects. One purpose of this circular was to implement the directive of Executive Order 11514 that Federal agencies should establish two-way communication with the public in carrying out the purposes of the NEPA. The new policy provided for at least three well-publicized public meetings during preauthorization project planning to provide the public with information on alternative planning proposals. The public meetings would also be used to provide the Corps with information on public attitudes and preferences. The circular also provided for an additional public meeting to take place in the advanced planning phase of authorized projects in cases where there had been a long time lapse, conditions had changed, or an environmental controversy had arisen since the last public meeting (14). Then on November 30, 1970, the Corps issued a definitive statement of its procedures under the NEPA, in the form of "environmental guidelines." These guidelines would henceforth be used in all phases of the civil works program including planning, design, construction, and operation. The guidelines asserted that the Corps would examine and give equal weight to environmental values, together with economic, social, and technical factors, when studying alternative means to meet human needs. They also stated that projects would not be recommended unless they were not merely economically justified, but were "the best solutions to the problems" (15).

The Increase in the Discount Rate

Appropriations are not made to begin construction of Corps of Engineers or other authorized water resources projects unless, by current evaluation, "the benefits to whomsoever they may accrue are in excess of the estimated costs." The Bureau of the Budget (BOB), perhaps inspired by the views of an influential sector of the economics profession (16), had long believed that Corps of Engineers and other water agencies' evaluations of the economic efficiency of water projects were too generous. The

BOB believed, in particular, that the interest rate used in "discounting" future benefits was too low because it did not reflect the opportunity cost of the government's investment (17).

In January 1968, President Johnson instructed the Water Resources Council (which had statutory authority to develop water project formulation and evaluation methodology) to develop a "more appropriate" discount rate. The reason given by the President for rejecting the discount rate formula of Senate Document 97 was that the 3¼ percent result was significantly lower than the Treasury's cost of borrowing (on which it was intended to be based) (18). Although the new formula adopted by the Water Resources Council in December 1968 immediately resulted in a large increase in the discount rate, it was a compromise formula. This formula was based, not on the opportunity cost of capital, but on the interest rate of Government bonds⁴ and further provided that the discount rate would not be raised (or lowered) more than one quarter of 1 percent a year (19).

Under Senate Document 97, the discount rate had been 3¼ percent for 6 years. Now a new discount rate of 4½ percent was announced to take effect in fiscal 1969; it was raised to 4⅞ percent at the beginning of fiscal 1970. This meant that some authorized projects would lose their favorable benefit-cost ratio unless, on reevaluation, new benefits could be found for them. Furthermore, it seemed probable that projects postponed another year would have their future benefits evaluated at a discount rate of 5⅞ percent.⁵ It had now become very difficult to start construction of marginal projects and large projects, such as new navigation canals, which have benefits accumulating slowly over a long period of years.

Planning

The Corps regular "project development" program concerned preauthorization planning of navigation, flood control, multiple-purpose, and beach erosion projects. It consisted of project or river basin surveys authorized in omnibus rivers and harbors acts or by review resolution of congressional public works committees. These surveys recommended for or against authorizing a project on the grounds of its engineering feasibility and its

⁴The question of what constitutes an appropriate discount rate for use in calculating the future benefits of natural resources investments is an important controversy in economics. It cannot be adequately dealt with in this history except to show its effects on Federal water development programs.

⁵In fact, the discount rate went up ¼ of 1 percent in each of fiscal years 1971, 1972, 1975, and 1976 and ⅓ of 1 percent in each of fiscal years 1973 and 1974

favorable benefit-cost ratio. They were reviewed and criticized by the States (without whose approval they were unlikely to be authorized) (20) and by other Federal agencies whose missions would be affected by the proposed development.

But new developments in national water policy caused the period 1966-70 to become one of considerable evolution beyond the project development concept in the Corps' planning program. In 1965, the Water Resources Planning Act established the Water Resources Council to coordinate all Federal water resources planning policies and to review comprehensive, interagency, intergovernmental river basin plans. (The objective of river basin plans was declared to be the optimum use of the water and related land resources of the area involved and not merely the justification of proposed projects (21).) Then, in 1966, the Civil Works Study Board recommended that planning should include consideration of both developmental and managerial alternatives in order to obtain optimum solutions to water problems (22).

At about the same time, the Corps, in response to President Johnson's directive to the entire executive branch, began developing its program planning and budgeting system. This resulted in a new method and basis for selecting new starts from the backlog of authorized projects. Beginning in fiscal 1968, 5-year investment programs were prepared every year which purported to be based on national and regional priorities. Priorities among regions and projects were determined by identifying developmental goals and examining and eliminating alternative means for reaching those goals (23).

As a result of these and other contemporary events in the late 1960's, the Corps participated in a number of special studies with somewhat different methodology or different or broader goals than its "regular" survey program.⁶ These included two studies authorized in 1965 legislation, the Appalachian Water Resources Survey (24), and the Northeastern United States Water Supply Study (NEWS Study) (25), as well as the Water Resources Council's comprehensive planning program. In addition, the Rivers and Harbors Act of 1968 directed two nationwide studies of erosion problems of the Nation's stream banks and shorelines, respectively (26).

The Appalachian Water Resources Survey

The Appalachian water study was the first in which the Corps was directed to prepare a water development plan for the specific

⁶The Corps participation in studies of the feasibility of importing water from the Mississippi River into West Texas and eastern New Mexico will be discussed in connection with the program of the Bureau of Reclamation.

purpose of regional economic development. Section 206 of the Appalachian Regional Development Act directed the Secretary of the Army to prepare a comprehensive plan for developing and using the water and related land resources of the region as an integral part of the overall regional development authorized by the act. It also directed him to give special attention to increasing economic opportunities and authorized him to recommend flood control, water supply, and hydropower developments, mine drainage, recreation, and navigation improvements. The plan was to be prepared in cooperation with the Appalachian Regional Commission, the States, USDA, TVA, and other appropriate Federal departments and agencies (27).

The 26-volume report on the water resources of Appalachia was completed in December 1969. It featured (1) an early action program consisting of projects to be constructed by the Corps, SCS, TVA, and the State of Pennsylvania; (2) future project studies; and (3) Federal and State program activities (28).⁷ The Corps early action projects were high priority projects intended to be incorporated into the Corps new program budgeting system (29). Benefits of early action projects were allocated to recreation, flood control, navigation, water quality, water supply, and other purposes, in that order (30).

Several significant changes in planning methodology were tried out in the Appalachian water study. One was an early version of what was coming to be known as multiple-objective planning. For this, the effects of all projects were assessed with relation to three objectives: (1) regional economic development, (2) national income gains, through use of unused and underused labor and capital resources, and (3) environmental quality (31).⁸ Two performance indices (for regional and national economic gains) were developed for each of the projects in the early action program, instead of a benefit-cost ratio reflecting only national income gains. (However, no new benefit-cost analyses were made for projects for which design funds had already been appropriated (32).)

The benefit analysis used in the Appalachian study also departed from traditional Corps practice by tracing the benefit flow beyond initial users of project services and products to

⁷The Corps early action projects included ten recommended for authorization. One authorized inactive project (the Coosa River navigation project) was reevaluated and recommended for reclassification and early construction. In addition, the Office of Appalachian Studies and the States recommended a number of active authorized projects for early construction. The most strongly urged of this latter group was the controversial Tennessee-Tombigbee project.

⁸But the environmental quality objective in the Appalachian study was limited to the correction of environmental problems which inhibited the growth of the regional economy.

something resembling the controversial secondary benefits used by the Bureau of Reclamation. Benefits were divided into two categories: (1) user benefits and (2) expansion benefits, induced or stemming from projects. Although user and expansion benefits were included in both the regional and national accounts, expansion benefits were the principal measure of regional income gains (33).

The Appalachian study did not conform to another requirement of multiple-objective planning theory, however, because it did not compare the potential of water resources development with the potential of alternative investments in education, health, overland transportation, and so forth, to accomplish the same ends. As would be pointed out by the Secretary of the Army in his 1971 report, this was because these broader alternatives were within the planning jurisdiction of the Appalachian Regional Commission (34). The plan also did not give a great deal of consideration to such water resource development alternatives as regional waste treatment or distribution systems for municipal and industrial waters. This was because it was felt that there was no institutional structure to implement such developments and that the early action program should be based on established Federal authorities (35).

For the same reasons, the study did not attempt to plan the location of water-cooled thermal electric plants or single-purpose (non-Federal) hydroplants or to delineate the full water-oriented recreation potential of the region. But it did plan for recreation developments at Federal projects and at two State projects, for which Federal grant funds could be made available (36).

The plan also recommended that 171 communities obtain flood hazard information and other flood plain management services from the Corps and TVA (37). It identified an area in Kentucky and Tennessee where local flood protection structures would be ineffective unless combined with an innovative flood damage prevention program requiring flood proofing of residential structures (38). In another case it recommended a local flood protection project that would make possible a later urban renewal project (39).

The Corps also collected initial data for an investigation of mine drainage pollution. But amendments to the act in 1967 gave the principal responsibility for this part of the Appalachian water study to the Appalachian Regional Commission (40).

The Northeastern United States Water Supply Study

Another study that represented an entirely new direction was the NEWS study that was authorized at the height of the Northeast "drought" of the early 1960's. This study was not funded

until fiscal 1967 and not completed until the 1970's.

Title I of the Rivers and Harbors and Flood Control Act of 1965 authorized a Corps study devoted entirely to water supply in cooperation with Federal, State, and local agencies. It directed the Corps to prepare plans to meet the long range water supply needs of the great east coast megalopolis that stretches from Norfolk to Boston and the rural watersheds of all the rivers on which those cities are located.⁹

It also authorized the Corps to construct,¹⁰ operate, and maintain major water supply reservoirs, major interbasin conveyance facilities, and major intake purification facilities, provided that the States or localities would participate in financing them (41).¹¹

Before the NEWS study, the Corps had been responsible for comprehensive planning of urban water supply only in the District of Columbia (which was also part of the NEWS area). Elsewhere, the Corps was authorized to provide reservoir storage only in projects constructed for the primary purposes of flood control, navigation, and multiple purposes including hydropower. Title I specifically authorized the study of two measures that had previously not been part of the Corps water supply planning: (1) interbasin transfer facilities,¹² and (2) purification facilities at water intakes.

The NEWS study was set up to be very "modern" in its thorough consideration of alternatives not generally considered in Corps project development. These included engineering measures such as ground water developments, desalination, tidal impoundments, and physical interconnection of local water supply systems. Each such engineering measure was to be evaluated in terms of its effects on other water resource uses, including environmental uses. The NEWS study was coordinated from the beginning with the ongoing North Atlantic Regional (NAR) study.

The NEWS study also included contract studies of the legal and institutional changes that would be required to effect interconnection of water supply systems in the three-State New York City metropolitan area and in the greater Boston area. It also provided for contract studies of the economics of the water

⁹The study area also included northern New England and New York State, which are less urbanized areas and not hydrologically connected with megalopolis.

¹⁰After specific project authorization.

¹¹The implication was that the Corps would actually build only the large-scale facilities recommended in the plan (and only surface water facilities).

¹²This was also to be a feature of the Corps investigation (in cooperation with the Bureau of Reclamation) of the feasibility of importing water from the Mississippi River into west Texas and eastern New Mexico. See chapter 6.

supply industry. The contract studies included financing problems of municipalities and public and investor-owned water utilities, methods of evaluating water supplies, and alternative approaches to Federal participation in the water supply function (42).

Comprehensive Studies

The Corps also took part in all of the comprehensive water resources studies sponsored by the Water Resources Council in this period. These included type I large regional framework studies (which provided long-run projections of water and related land resource problems and solutions), and type II feasibility studies (which did the same for subregions or river basins). The type II studies also included planning in sufficient detail to serve as a basis for recommending authorization of projects. The Corps not only participated in, but led, several of the framework studies and most of the feasibility studies. These studies were based on Corps river basin survey authorizations of the early 1960's or, in some instances, the 1950's. They were carried out by ad hoc coordinating committees chaired by the appropriate Corps division or district office,¹³ similar to the interagency coordinating committees the Corps had set up in the Delaware and Potomac basins in the 1950's. The coordinating committees did not have independent staffs or budgets and were largely funded by direct appropriations to the Corps, which distributed funds to other Federal agencies to enable them to perform their parts of the studies (43).

The North Atlantic Regional Framework (NAR) study and the Susquehanna River basin study were two of the most innovative studies done under the Council's comprehensive studies program. Like the NEWS study, they were led by the North Atlantic Division of the Corps.

The North Atlantic Regional Study. The NAR study attempted to incorporate into the planning process both the most recent developments of planning theory (giving full consideration to alternative objectives and means and public preferences) and the most recent developments of planning methodology (featuring systems analysis and the use of computers) (44).

Needs for water and related land resources extending to the year 2020 were estimated on the basis of three objectives:

¹³Three of the 12 type I frame work studies underway in the years 1966-70 were led by Corps of Engineers divisions. They were the Ohio River, North Atlantic, and upper Mississippi studies. Thirteen out of fifteen type II studies were led by Corps districts and two by the Pacific Northwest Inter-Agency Committee.

regional development, national income, and environmental quality. The three objectives were weighted in proportion to their importance for each of the 21 areas of the region (the environmental quality objective was given the greatest emphasis in most areas). Mixed-objective programs—consisting of needs, “devices,” and benefits and costs for water, land, and environmental management—were drawn up for each area (45).

The NAR study found that water quality maintenance needs were the most important throughout the region. It found that these needs would require the largest investments for such devices as secondary and advanced waste treatment plants, monitoring facilities, acid mine drainage control, stormwater discharge control, and separation of combined sewers. Research would be very important to enable these devices to meet the need (46). Need for public and industrial water supplies were also found to be important as was (mainly saline or brackish) water for power plant cooling. Hydropower generation and navigation were found to be of less importance (47).

The NAR study considered that flood damage reduction while important, was part of the land—not the water—management program. Additional upstream reservoirs in combination with land treatment and flood plain management measures would be necessary for upstream protection, but flood plain management was to be the most extensively used device for mainstream flood damage reduction after the flood control structures then under—or at the point of—construction were completed (48). Stream bank erosion and especially ocean shoreline erosion control needs were seen as becoming increasingly important as were scenic preservation, fish and wildlife, and recreation needs. The latter were seen as requiring a variety of devices, most of them involving expansion and better use of existing water facilities rather than additional reservoirs (49).

The Susquehanna River Basin Study. The Susquehanna Basin type II study had a very large input from State and other Federal agencies (particularly Interior Department agencies) (50). It began in 1963 and was converted in 1966 into an experiment in multiple-objective planning in a basin that had a depressed economy but whose greatest single immediate problem was nonetheless found to be pollution (51). In 1969, the study also became an experiment in public participation in water resources planning. A research team from the University of Michigan set up a series of planning workshops and well publicized public forums to enable community leaders and the public at large to criticize and make suggestions about developmental alternatives. Local viewpoints thus elicited were

incorporated into the final plan which was submitted to the Water Resources Council in June 1970 (52).

The plan recommended a total of 304 structural projects of which half were part of an early action program recommended for commencement by local, State, and Federal agencies within 10 years. The early action program included 13 coal mine drainage-abatement projects that were then undergoing detailed study by the Corps, 22 advanced waste treatment, and 61 primary and secondary waste treatment plants. It also recommended further detailed study of the potentials for combining some of the treatment plants into regional sewage systems. In addition, the early action program included 6 major multiple-purpose reservoirs to provide various combinations of flood control, water supply, low flow augmentation, recreation, and fishing. It included four low channel dams, 62 ground-water developments, and 4 pipelines for municipal and industrial water. It also included 7 local flood prevention projects and 9 upstream watershed projects containing 19 small impoundments for flood control and recreation.

The study recommended intensive flood plain management programs for 111 areas and intensified flood warning and evacuation programs for another 125. The study selected 17 of the most flood-vulnerable areas as having highest priority in the early action period. Four areas were selected because they included low channel dams and their associated recreation facilities; and 13 other areas were selected because they were either already urbanized or in the path of predicted urban development. The study also classified selected stream reaches for appropriate management, as wild, scenic, recreation, or modified recreation streams (53).

Section 209 of the Rivers and Harbors and Flood Control Act of 1970

A Water Resources Council task force began work in November 1968 on the development of multiple-objective planning principles and standards that would be applicable to all water resources projects. The principles and standards would be based, not on three objectives, but four: national economic development, regional economic development, environmental quality, and social well-being (54). The Council's effort was strongly urged and heartily supported by leaders of the congressional rivers and harbors bloc. These congressional leaders felt that the recent increase in the discount rate used in calculating future benefits would mean that many worthy projects could not henceforth be justified, unless other kinds of benefits, particularly regional development benefits, could be counted (55). In addition, the Corps, the Council, and influential

independent scholars favored the adoption of multiple-objective planning as better reflecting the real factors that motivate water resources development than national income gains alone. They thought that multiple-objective planning would provide a way to show how all these real factors would be served by alternative plans so that decisions could be made on an informed basis (56). Consequently, section 209 of the Rivers and Harbors Act of 1970 provided that it was the intent of Congress that the four objectives under consideration by the Water Resources Council be used to evaluate the benefits and costs attributable to water projects. It further provided that due consideration be given to alternative means of accomplishing these objectives (57).

Water Quality Studies

Depending on how it would be implemented, section 209 might presage an expansion in the Corps traditional construction program of flood control and navigation improvements or a diminution of this program in favor of increasing reliance on nonstructural alternatives. But three other provisions of the omnibus act of 1970 clearly foresaw a change in direction, by giving the Corps an opportunity to apply its planning expertise to questions of water quality. These included a study of measures to improve the grossly polluted Cuyahoga River in cooperation with concurrent programs of Federal and State agencies (58), a comprehensive joint study with the Environmental Protection Agency (EPA) of regional water supply and waste water management in the Susquehanna basin (59), and a study of the effects of strip mining operations on navigable rivers, with recommendations for measures to mitigate any adverse conditions due to strip mining practices (60).

Another urban-oriented water quality planning undertaking was requested by the Corps itself, authorized by resolutions of House and Senate public works committees, and approved late in 1970 by the Office of Management and Budget and the two appropriations committees. This was the initiation of a program of pilot waste water management studies in cooperation with the Water Quality Office (of the newly created EPA) and State and local governments. The pilot study areas with severe pollution problems were five major metropolitan regions inhabited by 12 percent of the Nation's urban population: the greater Boston area, the Cleveland-Akron area, the Chicago metropolitan area, the Detroit metropolitan area, and the San Francisco Bay area. The objective of these studies was to identify a wide range of feasible alternative methods (including land disposal as well as water disposal methods) for achieving a very high level of water quality on a regional basis. These studies were intended to lead

to the development of detailed alternative plans which the involved States and cities could select from and use as a basis for requesting construction grants from EPA and the Department of Housing and Urban Development (61).

Navigation Improvements

The expansion of the Corps rivers and harbors improvements program (to include the construction of new navigation channels) that took place in the Kennedy and early Johnson administrations is described in chapter 1. The navigation improvements program continued at a relatively high level of activity in fiscal years 1966-68 (table 2). But by fiscal 1969, in part as a result of environmentalist opposition to new canal projects (62),¹⁴ and in part as a result of the increase in the discount rate, the program began a significant decline.

This oldest program of the Corps was the most controversial throughout the decade. No other Corps program was supported with such enthusiastic expectations of economic growth by congressional proponents of water development (63). But at the same time no other program was viewed so suspiciously by the BOB or attacked so continuously by critics of the Corps overall program on economic efficiency grounds (64). Thus, for example, the 450-mile Arkansas River project, under construction during the latter part of the decade, was attacked in books and popular magazines as a particularly cynical use of political power to obtain the installation of an adventurist engineering scheme (65). At the same time, even before its completion, it was praised in Congress as a new TVA, bringing needed industrial and commercial development to the poorest section of Oklahoma (66).

One criticism of the navigation improvements program voiced during the 1960's, as it had been from time to time since the days of the New Deal national resources planners, concerned cost sharing. Beginning with Franklin D. Roosevelt's budget message of 1940, all recent Presidents had declared that there

¹⁴Waterways projects involving the modernization of existing navigation channels had generally attracted less environmentalist opposition than reservoir projects. But the new canals under or awaiting construction during the late 1960's and 1970 attracted a great deal. The most bitterly opposed of these projects was undoubtedly the Cross-Florida Barge Canal. In addition, there was environmentalist opposition to the Ohio River-Lake Erie Canal, the Tennessee-Tombigbee project and the Trinity River project. The Ohio River-Lake Erie Canal project was discontinued in 1967, however, largely because Pennsylvania interests believed that its benefits accrued only to Ohio. Both the Tennessee-Tombigbee and the Trinity River projects were to become the subject of environmental litigation in the 1970's.

was no longer any rational justification for Federal assumption of the entire cost of constructing, operating, and maintaining navigable waterways. All recent Presidents had proposed that waterways users pay a larger share of project costs than the public at large (67). Earlier cost-sharing proposals had focused on tolls, but President Kennedy had recommended user charges in the form of fuel taxes in his Budget Message of 1962, and fuel tax legislation was later requested by both Presidents Johnson and Nixon. But Congress did not enact such legislation (68).

Proponents of user charges were motivated not only by considerations of equity but of efficiency in allocation of investments. They considered that such charges were necessary to make sure that those urging a project—whether prospective shippers and carriers, local government, business, or political interests—sincerely anticipated that its direct benefits would be greater than its costs, not merely that the costs would be paid by the Federal Government (69). Opponents of user charges saw this concern as largely irrelevant; in their view, waterways projects were needed as much for their indirect benefits to regional economic growth as to accommodate traffic. They believed that user charges would retard essential water developments, destroy the economic justification of multiple-purpose projects, and increase inflationary pressures by increasing transportation costs. In addition, they pointed out that the existing waterway industry had been based on the premise that the long tradition of toll-free waterways would continue. They pointed out that large private investments in equipment and facilities had been made on this basis, and that suddenly increasing waterway transportation costs might have dire consequences for established businesses, employment, and the waterway industry itself (70).

The political impossibility of imposing user charges as a pricing mechanism was perhaps the reason for another approach to the problem of ensuring the efficiency of navigation improvements. The BOB and the Corps itself took this approach during the 1960's, but Congress rejected it. It consisted of imposing more rigid standards for the economic justification of waterways projects.

The traditional methods for estimating the benefits of proposed projects had involved computing the amount of future traffic on the waterway on the basis of a comparison of current overland (usually railroad) rates and water rates. This was considered by critics of navigation project evaluation methodology to result in an overestimation of future traffic on the waterway, because it ignored the probability that future rail rates would be lowered to meet the competition of the new waterway and would decline, in any event, as a result of

improved technology. They also considered that benefit-cost analysis based on predicting future traffic on the waterway and savings to shippers who converted from rail to waterway transportation would result in overestimating the national benefit of a project, even if it were done with perfect accuracy. This was because this method did not offset the gains to shippers on the waterway with losses to competing businesses located elsewhere (71). Critics of traditional evaluation methodology asserted that real national benefits should be measured by reductions in actual transportation costs (that is, costs for labor, capital, and other resources) resulting from switching from rail to waterway transportation instead of reductions in rates charged shippers. But this was admittedly very difficult to calculate (72).

In November 1964, the Chief of Engineers promulgated an instruction to the effect that, until acceptable data for calculating the real costs of waterway and alternative modes of transportation were developed, comparison with future overland rates that reflected the competition of the waterway would be used (73). The effect of the use of "water-compelled rates" was that waterway benefit calculations were smaller. Congressional waterways enthusiasts complained bitterly because no major authorized navigation project whose efficiency was evaluated after this instruction went into effect could be started. This threatened their vision of a new network of canals fostering regional industrial development (74). In particular, the Board of Engineers for Rivers and Harbors could not find a favorable benefit-cost ratio for the Lake Erie-Ohio River Canal until this rule was rescinded (75).

In August 1966, a letter from the Director of the Budget to the Chairman of the House Public Works Appropriations Subcommittee discontinued the instruction of November 1964 (76). Then in October of 1966, the old "current rates" standards for calculating navigation benefits were enacted into law as a definition of such benefits, in section 7(a) of the Department of Transportation Act (77). This was done at the urging of members of the congressional rivers and harbors bloc, despite the united opposition of the Johnson administration and the Corps (78). Henceforth, it would be impossible for the Corps to again change its standards for calculating navigation benefits without an act of Congress.

Flood Plain Management

The Corps' modest program of providing flood hazard information regarding specific localities to State and local governments was both strengthened and broadened during the latter half of the decade. The Rivers and Harbors and Flood

Control Act of 1965 raised the amount authorized to be appropriated for it from \$1 million to \$2.5 million a year (79). The omnibus authorization act of the following year, in addition to expanding the scope of the program, raised the funding limit to \$7 million a year (80). But requests for services continued to out-run the capacity of the Corps to meet the demands (81).¹⁵

The inspiration for both the increases in the Corps Flood Plain Management Service program and other Federal efforts to reduce flood damages by controlling land use was House Document No. 465 of the 89th Congress (82). This was the 1966 report of a Presidential task force consisting of Federal, State, and local agency personnel and chaired by an outside expert, Gilbert F. White, the University of Chicago geographer and leader of research on flood problems. As a result of the recommendations of House Document No. 465, section 206 of the Rivers and Harbors and Flood Control Act of 1966 increased the scope of the flood plain management service program. The program now included: (1) authority to provide guidance and technical assistance in planning land use in addition to information about flood hazards, and (2) authority to provide information and other technical services to Federal agencies (83) to help them comply with Executive Order No. 11296 of 1966 (84).¹⁶

In the last years of the decade, a number of Corps survey reports recommended regulatory floodways in conjunction with channel enlargements, floodproofing, and planned emergency evacuation. In Waterloo, Iowa, a flood plain management scheme and local flood protection works recommended by the Corps were integrated into an urban renewal project supported by HUD. And a Corps report on Prairie du Chien, Wisconsin, recommended Federal cost sharing for residential floodproofing and moving houses to higher ground (85). However, Prairie du Chien was a sparsely populated, low-lying Mississippi River island and adjacent mainland area for which no structural measures could have been economically justified (86).

It was not official Corps policy until 1970 for Corps planners to recommend floodplain use controls except: (1) in areas where dams, levees, and channel projects could not be economically

¹⁵Enactment of the Rivers and Harbors and Flood Control Act of 1970, on the last day of the decade, raised the authorized amount again, to \$11 million. But even this level of funding did not appear sufficient to enable the Corps to achieve the level of annual service activity recommended in 1966 by the Presidential Task Force on Federal Flood Control Policy.

¹⁶This Executive order (based on recommendations 6, 7, and 8 of House Document No. 465) directed all Federal agencies to take account of the flood hazard when making decisions regarding construction of buildings, disposal of lands, mortgage insurance, and assistance to State and local governments for planning and development.

justified; (2) to protect the effectiveness of structural projects; or (3) to reduce damages where such projects were justified but were awaiting authorization or appropriation of funds and construction (87). However, in August 1970, the Chief of Engineers issued a planning regulation which stated that henceforth all flood damage reduction alternatives should be examined without prejudice (88). This meant that the Corps and Corps-led coordinating committees could henceforth plan for floodplain regulation as a substitute and not merely a supplement to flood control structures. The Corps "Environmental Guidelines" regulation of November 1970 reinforced this policy (89).

Regulation Under the Rivers and Harbors Act of 1899

The Corps' traditional authorities to regulate the navigability of navigable waters were authorized by a block of related sections in the Rivers and Harbors Act of 1899 (90), which in turn were a codification of scattered earlier laws (91). These "ancient" authorities were reinterpreted during the period 1966-70, largely as a result of pressure from the environmental movement, and converted into tools that could be used to protect shorelands or to abate industrial water pollution.

The most significant substantive sections of the act of 1899 were sections 10 and 13.¹⁷ Section 10 stated that it was unlawful to dredge, fill, erect structures (including sewer outfalls) in navigable waters, otherwise obstruct such waters or alter or modify their courses, without a permit from the Corps of Engineers. It was estimated that in the late 1960's and 1970 the Corps had been issuing about 8,000 such permits a year (92). Section 13, also known as the Refuse Act, prohibited the discharge or deposit of any refuse (whether from a vessel or from land) except "that flowing from streets and sewers and passing therefrom in a liquid state," without a permit from the Corps. But, until 1970, only four permits had ever been issued under section 13 because no specific program had ever been created to issue them (93).

Instead, the Corps had used section 13 as the basis for criminal prosecutions and injunctions against industrial plants that

¹⁷Also of importance was section 11 which authorized the Corps to establish harbor lines defining the offshore limits of bulkheads, piers, and fills. Until May 1970, Corps regulations provided that riparian owners might fill in or erect structures up to the harbor lines without obtaining a permit under section 10. They did, however, require a permit for dredging.

deposited solid waste in shipping channels, which the Corps was obligated to remove as part of its waterways maintenance responsibilities (94)¹⁸ and against oil spills (95)¹⁹ which could constitute a fire hazard. However, a Supreme Court decision in 1966 (96) and lower court decisions in 1967 (97) and 1969 (98) made it apparent that section 13 was being read as prohibiting discharge of any polluting material (except municipal sewage) without reference to effect on navigability.

Permits to Dredge, Fill, Excavate, or Erect Structures in Navigable Waters Under Section 10

The Fish and Wildlife Coordination Act required the Corps to consult with the Fish and Wildlife Service and State fish and wildlife agencies "with a view toward conservation of wildlife resources" prior to issuing permits for work in navigable waters (99). The act did not provide that the Corps must accept Federal or State wildlife agency recommendations, however. Instead, Corps practice was to inform the permit applicant of the wildlife agency objections and then make an effort to reach a compromise solution on the district level by issuing the permit, subject to conditional restraints. If this effort was unsuccessful, the matter was referred to the Chief of Engineers, who would decide whether to issue the permit and, if so, whether to impose conditions that would mitigate damage to wildlife (100).

Under this system the Corps sometimes issued permits over the objections of the Fish and Wildlife Service and other environmental protests (101). This led, in 1967, at the height of congressional and public concern for protection of estuarial resources, to a legislative proposal for a system of environmental protection permits for dredge and fill operations in estuaries, to be administered by the Secretary of Interior (102).

¹⁸Section 17 of the act of 1899 authorized the Justice Department to conduct "the legal proceedings necessary to enforce the act." It did not say that the Department could take action only on request of the Corps but did state that it was the former's "duty to vigorously prosecute all offenders" when requested by the Corps.

¹⁹In 1968 it became Corps policy, by agreement with the Federal Water Pollution Control Administration, to use prosecution under the Refuse Act as a pollution control device against oil discharges from both vessels and shore installations. This was because a little-noticed provision of the Clean Waters Restoration Act of 1966 had been found to have virtually destroyed preexisting Federal authority to prosecute oil discharges from vessels in navigable waters. The act of 1966 had transferred the Corps authority, under the Oil Pollution Control Act of 1924 to the FWPCA, at the same time changing the statutory language to remove liability for oil discharges that were neither "willfull" nor "grossly negligent."

In July 1967, partly in order to avoid the necessity for a dual permit system (103), the Secretaries of the Army and Interior signed a memorandum of understanding for better coordination of their responsibilities. The memorandum of understanding provided that the District Engineers must notify regional directors of the Department of Interior agencies responsible for fish and wildlife, water pollution control, and recreation about permit applications. The regional directors were responsible for making investigations, consulting appropriate State agencies, and advising the district engineer as to whether the work proposed would violate applicable water quality standards or unreasonably impair natural resources or the related environment.²⁰ District engineers would provide public notice of permit applications. Whenever the response to such notice indicated that the proposed work was controversial, the district engineers would also hold public hearings on environmental as well as navigational aspects of the proposed works.

Efforts would be made to resolve agency differences at the district engineer-regional director level. But if this were not possible they would be resolved by the Chief of Engineers in consultation with the Under Secretary of the Interior and, if still unresolved, by the Secretary of the Army, after consultation with the Secretary of Interior (104).

After the Corps revised its regulations in conformity with the memorandum of understanding, it apparently stopped issuing permits that the Department of Interior protested as environmentally destructive.²¹ At any rate, subsequent environmentalist objections to granting fill permits at Hunting Creek on the Potomac (105) and in San Francisco Bay (106) were directed not so much to alleged developmentalist intransigence on the part of the Corps as to inadequate responsiveness of the Department of Interior to field level objections to permit applications.

²⁰In practice, the field supervisors of Interior Department agencies reported their objections to the regional coordinator of the Department who sent a departmental response to the district engineer.

²¹The viability of the Corps' new policy of deferring to Interior Department environmental objections was threatened by the U.S. District Court decision in *Zabel v. Tabb*, 296 F Supp. 764, (M.D. Fla. 1969). In this case, the Corps, on the advice of the Bureau of Sports Fisheries and Wildlife, rejected the fill permit application of land developers who had bought 11 acres of submerged land in Boca Ciega Bay, Florida, from the State. Applicants sued the Corps to compel it to issue the permit and the Court granted them summary judgment, on the grounds that the Rivers and Harbors Act of 1899 had given the Corps no jurisdiction to deny permits on other than navigational grounds. However, this decision was appealed in July 1970 and reversed by the 5th Circuit Court of Appeals (430 F2d. 990). The circuit court based its decision on Congress' intent that Federal water agencies protect the environment from the effects of their own activities, as expressed in the Fish and Wildlife Coordination Act, the newly enacted NEPA and other measures.

In mid-1969, at least partly in response to requests of an environmentalist subcommittee of the House Government Operations Committee, the Corps began to review all its regulations governing the issuance of permits for work in navigable waters. This culminated in the institution of additional reforms in the spring of 1970 (107), including:

- (1) A new policy reducing the functions of harbor lines to that of guidelines for determining the offshore limits of construction with respect to navigation, but not to environmental values. Persons wishing to undertake any work shoreward of established harbor lines would henceforth be required to apply to the Corps for work permits (108).
- (2) A regulation that applicants not only define the area they want to fill but describe the type and location of structure proposed to be erected on the fill. Henceforth, permittees would be required to obtain a permit modification before changing the use to be made of the filled tract, erecting structures not described in the permit, or significantly changing the appearance of approved structures (109).
- (3) A regulation that applicants whose proposals for structures on fill included sewer outfalls provide details on the chemical, physical, and biological character of the effluent and the amount and frequency of the discharge, together with proposed methods for monitoring the discharge.²² The district engineer was henceforth required to consult with Federal and State water pollution control agencies before issuing a sewer outfall construction permit. Permittees were required to maintain discharge records and provide them to the district engineer on request and to refrain from changing the composition of the effluent without first obtaining a permit modification (110).

In 1970, after passage of the NEPA, the Corps also began to prepare environmental impact statements in connection with permit applications and to circulate them for review to State and Federal agencies with environmental expertise. As a result of this, some applications were refused on the grounds of adverse environmental impact (111).

Permits to Discharge into Navigable Waters Under Section 13

Until mid-1970, there was no permit program under section 13 of the Rivers and Harbors Act of 1899 and virtually no

²²Before this change of regulation, applicants for permits to construct waste outfalls had only been required to disclose information on the amounts of solids that would be discharged and the basis for cost reimbursement for removal of such solids.

advocacy of one. The regulatory role that a Refuse Act permit program could play was not obvious to the Corps, the Federal Water Quality Administration, or environmental movement activists. At first, no one realized that such a permit program could provide the effluent regulation needed to implement Federal and State receiving water quality standards.²³

Instead, the Refuse Act was viewed by environmentalist advocates as a means of circumventing entirely the delays, inefficiencies, and jurisdictional limitations that had been associated with attempts to regulate industrial water pollution under administrative procedures set forth by the Federal Water Pollution Control Act and State legislation. It was viewed as a way of dispensing with the Federal and State programs entirely and applying to the courts for a more effective type of regulation (112). Litigation under the Refuse Act could be used to stop dangerous discharges immediately (113)²⁴, as was proved so dramatically in the case of mercury discharges. It could be used (through the grand jury's power to subpoena company officials and examine them under oath) to find out exactly what substances industrial dischargers were putting in the water. This was a task that had proved very difficult under the Federal Water Pollution Control Act enforcement procedures (114). Of perhaps equal importance to the advocates of Refuse Act litigation, it could enable frustrated conservationists, enraged by notorious cases of industrial pollution that had slipped through the fingers of State and Federal water pollution control agencies, to go directly to the Corps district or local U.S. attorney with information about discharges and requests for abatement (115).²⁵ (Indeed section 17 of the act provided that half the fine levied against any illegal discharger could be paid to the person giving information which led to conviction.)

²³The Water Quality Improvement Act passed in April 1970 added section 21(b) to the Federal Water Pollution Control Act. This section required that applicants for Federal license or permit to conduct any activity that would result in a discharge into navigable waters obtain certification from the State that "applicable water quality standards" would not be violated by the discharge. Although this provision was intended to apply to the relatively small number of applicants for permits to erect structures containing waste outfalls on fill or submerged land, under section 10 of the Act of 1899, it was equally applicable to the much larger number of dischargers from shore outfalls who would require a permit under the Refuse Act, if a Refuse Act permit program were established.

²⁴The Refuse Act was criticized for making no distinction between polluting discharges and acceptable discharges, other than the securing of a nonexistent permit. In fact, the courts in 1969 and 1970 did not insist on complete abatement of discharges, apart from oil and toxic chemicals, but did insist on maximum practicable treatment.

²⁵Rep. Henry S. Reuss of Wisconsin, chairman of the House Subcommittee on Conservation and Natural Resources and leading figure in the "rediscovery" of the Refuse Act, informed U.S. attorneys of 270 cases of Refuse Act violations in his home State.

But by mid-1970, events had occurred that caused environmentalists to ask for effluent regulation through the institution of a Corps permit system, as an alternative to effluent regulation by litigation. The same events caused the Corps to begin to establish such a system. The most important of these events was the increasing reluctance of the Department of Justice to bring to trial instances of industrial pollution that were brought to its attention by environmentalists (116). In late 1969 and early 1970, U.S. attorneys had initiated 66 prosecutions under the Refuse Act. These included a number of suits against depositors of industrial wastes in the Calumet River and Chicago end of Lake Michigan who had been resisting Corps efforts to negotiate reimbursement for removing solids that had impeded navigation for many years (117). However, by June of 1970, the Justice Department, perhaps because it considered itself inundated with reports of Refuse Act violations, announced that it was adopting a policy of selective prosecution. Henceforth, U.S. attorneys would use the Refuse Act to prosecute accidental or infrequent polluting discharges only. Where the continuing industrial discharges that were admittedly "the greatest threat to the environment" were concerned, the Justice Department would defer to the abatement programs and procedures of State and Federal water pollution control legislation (118).

This horrified environmentalists, who had been advocating Refuse Act litigation precisely on the ground that both Federal and State water pollution control programs had proved inadequate to deal with industrial pollution. It led, among other things, to the request of Representative Reuss' subcommittee that the Corps take the lead in Refuse Act enforcement by informing all waste dischargers that they were obligated by law either to obtain a permit from the Corps or stop their discharges into waterways (119).

In July 1970, an Agency spokesman informed an environmentalist subcommittee of the Senate Commerce Committee²⁶ that the Corps was preparing to set up a permit program under the Refuse Act. He also stated that the Corps was preparing a budget request of \$4 million for this purpose (120). In August 1970, the Corps made a general public announcement that all existing dischargers must apply for permits. Applications for such permits included the same effluent disclosures required since May for permits to construct sewer outfalls. They also included the State certification of compliance with "applicable" water quality standards required by section

²⁶The Subcommittee on Energy, Natural Resources, and Environment, chaired by Senator Phillip Hart of Michigan.

'21(b) of the Federal Water Pollution Control Act. The announcement also stated that all water quality considerations in the program would be coordinated with the Federal Water Quality Administration (121).

On December 23, 1970, President Nixon issued Executive Order 11574 to clarify the division of responsibilities under the Refuse Act. This provided that the Corps would be responsible for administering the Refuse Act permit program. However, it also provided that the Water Quality Office of EPA, the successor agency to the Federal Water Quality Administration, would have complete responsibility for determining that discharges conform with water quality standards. Henceforth, violators of water quality standards (including standards imposed by EPA), when Federal-State or State standards were not available or were clearly deficient, would be ineligible for permits and liable for prosecution under the Refuse Act (122).

The Corps did not consider at this time that there was any requirement to prepare environmental impact statements under section 102(2)(C) of the NEPA for most of the many thousands of expected applications for Refuse Act permits.²⁷ This was because it was believed that the certification of nonviolation of water quality standards required by section 21(b) of the Federal Water Pollution Control Act performed the same function. It was thought that the requirement of certification brought the Refuse Act permit program within the category of EPA programs considered to be exempt from such requirements (123).²⁸

Disposal of Great Lakes Dredging Spoil

Another water quality problem that the Corps undertook responsibility for at the end of the decade concerned disposal of dredging spoil from heavily polluted Great Lakes harbors and tributary channels. During the late 1960's, the Corps was dredging about 10 million cubic yards of materials a year from projects in the Great Lakes, in order to maintain navigation depths. In the case of most projects, the Corps then deposited

²⁷It was believed that environmental impact statements might still be needed in cases where significant effects on aspects of the environment other than water quality were involved.

²⁸This line of reasoning was not to be sustained by the courts. On December 21, 1971, the U.S. district court for the District of Columbia ruled that an environmental impact statement was required in connection with every Refuse Act permit. Although this ruling made administration of the Refuse Act permit program impracticable, the concept of a national permit system for waste discharges was to survive and be reenacted, in section 402 of the Water Pollution Control Act Amendments of 1972.

the material in designated deep-water areas of the lakes. These areas were considered to be near enough to the harbors and channels for economical haul but sufficiently far from water supply intakes and bathing beaches to avoid contamination (124). Nonetheless, beginning in the mid-sixties, as water quality problems of the Great Lakes became the subject of great public concern, the water quality effects of lake disposal were increasingly questioned. The 1965 Lake Erie conference agreed that the Corps would meet with the conferees to develop a program for disposal of dredged materials that would protect water quality. However, no such program emerged from the meetings that ensued, and the Corps continued to dump dredging spoil in the lake (125).

In November 1966, on the advice of the Bureau of the Budget and in compliance with Executive Order 11288, "Prevention, Control and Abatement of Water Pollution By Federal Activities," the Corps began a pilot dredging spoil disposal study. This was a cooperative study with the FWPCA. Its object was to determine the effect of present dredging practices on Great Lakes water quality and to develop the most practicable methods for management of pollution problems related to dredging operations. Investigation methods included the building of experimental diked land disposal areas (126).

The June 1969 report of the Corps Buffalo District on the pilot study was tentative and ambiguous. This report did not find that there was "hard evidence" of adverse effects on lake water quality resulting from deep water disposal. It admitted, however, that aquarium tests—showing that heavily polluted dredged materials could kill small forms of animal life found in the lake and stimulate growth of nuisance algae—were probably significant (127). The report firmly recommended further research on dredging spoil disposal management (128), but also tentatively suggested, if Congress should find it economically warranted, a 10-year program of land disposal of dredgings from 35 especially polluted harbors (129).²⁹

However, events of the latter half of 1969 pushed the Corps onto an environmentally protective course. As a result of the pilot study, public hearings, and comments of Federal agencies and affected States, the Corps developed a proposal to authorize a program of land disposal for Great Lakes harbors and channel dredgings. The proposed program was recommended to Congress by President Nixon in April 1970 (130), and ultimately resulted in the inclusion of section 123 in the Rivers and Harbors Act of 1970.

²⁹It was assumed that 10 years of treatment of municipal and industrial wastes at their sources would make sediments in harbors and channels clean enough for lake disposal.

Section 123 authorized the Secretary of the Army to construct, operate, and maintain diked spoil disposal facilities for a period not to exceed 10 years, provided that the Great Lakes States or local government units agreed to pay 25 percent of the costs of construction. However, the 25-percent local contribution could be waived on EPA finding that the area was conforming with an approved pollution control plan. The Secretary was required to consult the Administrator of EPA as to where such spoil disposal facilities were most needed. He was also requested to comply with section 21 of the Federal Water Pollution Control Act and section 102(2)(C) of the National Environmental Policy Act (131).

6. THE BUREAU OF RECLAMATION

Like the Corps of Engineers, the Bureau of Reclamation entered the second half of the decade in a strong position with good prospects for growth. Like the Corps, the Bureau found at the end of the 5-year period that although its planning program had expanded, its construction program had declined (see table 4) and seemed destined to continue to decline, at least in a relative sense.¹ Like other water project programs, the Bureau's construction program had been held back in the last years of this period as a result of military expenditures and Johnson administration emphasis on programs dealing with the social problems of urban areas and inflation. Like other water project programs, it was also held up by environmentalist protests, and, beginning in 1969, the rising discount rate. But, in addition, the Bureau's construction program seemed to be in particular trouble because of problems relating to its own particular mission.

This was because the Bureau's principal and most traditional mission, the provision of opportunities for irrigated agriculture in the West, appeared to have lost a great deal of the political support that would be necessary to continue it. Ever since the 1950's, scholarly reports had asserted that reclamation program subsidies to irrigation were inconsistent with USDA's price support and acreage control programs (1). But until the late 1960's, these criticisms had little effect on Congress because united western support for irrigation projects outweighed the questioning of a few representatives of southern, eastern, and midwestern agricultural areas (2). However, in the tight budgeting situation of the late 1960's and 1970, this questioning began to have some effect on the funding policies of the Bureau of the Budget and the House Appropriations Committee (3). At the same time, the environmental movement and urbanization of many areas in the West damaged the unity of western congressional delegations (4).

¹The slight increase anticipated for the early 1970's, which began in fiscal year 1971, was not expected to be enough to permit the construction program to "catch up" with its backlog.

Table 4. Bureau of Reclamation construction expenditures, fiscal years 1965-71

| Fiscal year | Irrigation | Multiple-purpose reservoirs, including power | Power transmission | Flood control | Municipal water | Subtotal direct expenditures | Small projects, programs, loans, and grants | Grand total |
|------------------------|------------|--|--------------------|---------------|------------------|------------------------------|---|-------------|
| <i>Million dollars</i> | | | | | | | | |
| 1965 | 88.6 | 100.9 | 47.9 | 9.3 | (¹) | 246.7 | 12.0 | 258.7 |
| 1966 | 99.8 | 133.1 | 30.9 | 13.6 | (¹) | 277.4 | 18.0 | 295.4 |
| 1967 | 155.5 | 25.3 | 31.5 | 10.0 | 8.4 | 230.7 | 16.8 | 247.5 |
| 1968 | 127.0 | 36.3 | 31.5 | 13.5 | 3.1 | 211.4 | 13.6 | 225.0 |
| 1969 | 79.0 | 65.9 | 24.6 | 10.6 | 19.9 | 200.0 | 4.4 | 204.4 |
| 1970 | 64.7 | 63.0 | 23.1 | 2.3 | 23.9 | 177.0 | 3.8 | 180.8 |
| 1971 | 64.6 | 119.2 | 10.8 | 2.4 | 29.2 | 226.2 | 26.5 | 232.7 |

¹ Less than \$50,000. ² Although expenditures for this program were at a low level in fiscal 1971, they were projected to—and did—rise dramatically in the early 1970's.

Compiled from: Office of Management and Budget's Special Analyses—Budget of the United States, fiscal years 1967-73.

In the past, reclamation projects, unlike Corps projects, generally had been funded very shortly after authorization. This was thought to be a consequence of the fact that the much smaller number of reclamation projects were authorized in individual acts of Congress. Thus, they could be scrutinized before authorization at a higher level of planning detail and firmer degree of local cost-sharing commitment than Corps projects (5).

But in the late 1960's and 1970, many previously authorized projects were not started and many projects that were started were given construction funds at a slower-than-usual rate. As a result, both the Bureau of Reclamation and the Chairman of the House Interior Committee found themselves in an unaccustomed position. They were deliberately holding up the authorization of fully planned, economically and financially feasible projects that were unlikely to be soon funded (6).

In the past, too, the reclamation program had generally been supported by whatever presidential administration was in power. Beginning with Franklin D. Roosevelt, the relationship between Democratic presidents and the Bureau had been particularly close. Reclamation projects had been an important part of the natural resources policies of Roosevelt, Truman, and even Kennedy. Since Lyndon Johnson was both a westerner and an ex-Senator who had been a leading supporter of water development in his own State, he was expected to continue this tradition. This did not turn out to be the case. Instead, President Johnson instructed the Water Resources Council to raise the discount rate. Furthermore, he ignored the reclamation program in annual natural resources messages to Congress that emphasized national parks acquisition, wild rivers, and pollution control (7).²

Indeed, in 1967, two study commissions appointed by President Johnson—the National Advisory Commission on Food and Fiber and the National Advisory Commission on Rural Poverty—recommended that all Federal subsidies for irrigation (as well as other Federal agency programs of agricultural land development) be terminated. The objection of the Food and Fiber Commission to the Bureau's program was that it was "unsound policy to invest public funds in new farm capacity at a time when the overriding problem (was) too much capacity" (8, 9).³ The Rural Poverty Commission stated its

²President Johnson did recommend the central Arizona project in his natural resources message of 1967. But this occurred only after the concessions to environmental and Pacific Northwest interests that his own administration had sponsored were incorporated into the bill.

³It is ironic that this logical position should have finally been expressed in an official report to the President and begun to affect Budget Bureau policies at a time when the large food crop surpluses of the 1950's and early 1960's were in

preference for rural economic programs that emphasized industrial development and environmental improvements over those that emphasized land development for farming (10).⁴ This commission was particularly critical of the Bureau's irrigation program. The Rural Poverty Commission saw this program as subsidizing the development of prosperous new irrigated cotton and vegetable economies in the Southwest, at the expense of displaced farmworkers and impoverished rural communities in the Southeast (11).

The beginning of the Nixon administration in 1969 did not seem to promise any resurgence of the Bureau's irrigation program. For one thing, it was accompanied by the beginning of progressive increases in the discount rate, discussed in the previous chapter. Although the Bureau, unlike the Corps, did not at first reevaluate authorized projects that were about to be funded, such as the central Arizona project, the rising discount rate threatened funding of future projects (12). It would now be hard to find justification for a number of fully planned, locally supported irrigation projects whose seemingly sure authorizations had been postponed several years because of budgetary considerations (13). Direct benefits from irrigation were lower than those from municipal and industrial water and power. This made it improbable that many irrigation projects—or predominantly irrigation projects—other than modest projects involving simple diversions from nearby streams, would be planned in the near future.

This same conclusion could be reached by considering the collapse of public support for the concept of large interregional water transfers. It had been believed since the early 1960's that sufficient water could be provided by long distance interregional water transfers to rescue older irrigated farming areas that were

fact beginning to decline. This change in U.S. crop production patterns was of course not lost on the Bureau of Reclamation nor on congressional proponents of irrigation. Although they continued to defend the program from the charge of contributing to crop surpluses by disputing that reclamation project crops were a significant part of such surpluses, they also became increasingly confident during the latter part of the decade, when they argued that crop surpluses were not an important agricultural problem. They advanced from predictions that there would be no crop surpluses in the 1980's because of world food shortages and statements that there were no longer any real crop surpluses as a result of such programs as the food for peace program, to assertions that remaining crop surpluses were merely an inadequate reserve that could be quickly exhausted by catastrophe. But these arguments took no account of the large proportion of American cropland that was not in production and were not advanced with respect to cotton. See (9).

⁴The Rural Poverty Commission recommended that no more public money be invested in developing privately-owned farmland except "when land development offers the only feasible escape from poverty for Indians and other specific groups of rural poor people."

exhausting their ground water and to provide new irrigation for other areas. A number of proposals were made in the early and middle 1960's that the Bureau transfer water thousands of miles to augment the Colorado River and other water-short river basins (14). Several of these proposals were widely discussed in both technical and popular media. They were generally rejected by economists and other scholars who considered that arguments against Federal investment in irrigation were even more applicable when water was to be transported such a long distance (15), but they captured the imagination of some western political leaders and water planners (16). Moreover, they were at first reported in popular media with a certain amount of respect for their long planning horizons and promethean audacity as engineering feats (17). In the case of proposals to import water to the Colorado River, the import schemes themselves did not generate as much hostility from conservationist organizations as the hydrodams in the Grand Canyon that would be needed to pay for them. But, other interbasin transfer plans were opposed by conservation organizations as environmentalist consciousness rose concerning the effect of water diversions on estuarial resources (18).

The greatest opposition came from States whose water was to be exported. Because of this, the Colorado River Basin Project Act (as finally passed in 1968) contained a provision that the Bureau would not make any studies of importing water from States outside the basin for 10 years (19). As a result, the only interstate, interbasin transfer that the Bureau actually did study was the Texas Water Development Board's proposal to import water from the Mississippi River to the High Plains of Texas and New Mexico (20). This study was begun in 1967 and not completed until the 1970's. But, in 1969, when Texas voters rejected the State bond issue to help finance the M and I water feature of the plan (21),⁵ it became apparent that in the future it might be difficult to find support for such ventures, even in States to be benefited.

At the end of this period, spokesmen for the Bureau of Reclamation and the Nixon administration predicted that, in the 1970's, the agency's program must and would change radically in both its purposes and methods. It would deemphasize the construction of large irrigation and multiple-purpose projects that had been its principal reason for existence since the 1930's (22). Not all of the Bureau's over \$7 billion backlog of fully planned projects could now be built. The projects that would be built would tend to feature M and I water or

⁵Since there were no hydropower features in this plan, the payout of the irrigation features was dependent on revenues from M and I water.

would add to the installed capacity of hydropower plants (23). Furthermore, the recently quiescent Small Reclamation Project Act program would become a more truly multiple-purpose program and expand. This was because its larger local contributions, higher benefit-cost ratios, and lesser disturbance of the environment had won OMB approval (24).

These spokesmen predicted that, in the 1970's, the Bureau would primarily emphasize research to augment water supplies needed for irrigation by nontraditional technologies, both structural and nonstructural. The Bureau would emphasize weather modification, new environmental, aesthetic, and water-conserving concepts in project design and operation to provide optimum development of recreation and fish and wildlife. It would also strengthen its skills in economics and planning to make sure that its projects could withstand OMB's "tough questions," broaden its base of support, and explore new methods of financing (25).

At the beginning of the 1970's, the Bureau expected to devote the major part of its planning attention in the new decade to the Western United States water plan (Westwide study), which had been authorized by the 1968 Colorado River Basin Project Act. This was a reconnaissance level plan to meet the water needs of the 11 contiguous States west of the continental divide. However, Bureau spokesmen did not envision the Westwide study as primarily providing the basis for a new dam and aqueduct program that would be wanted when water or food shortages would cause the Nation to change its priorities again. Instead, they regarded this study as an opportunity for full exploration of the applicability of new technologies and long-range economic and population projections to local water problems (26). The new technologies included weather modification, wastewater reclamation, and desalination of geothermal water.

The Irrigation Program

The Colorado River Basin Project

An explosive issue of the early 1960's that has been discussed in chapter 3 was not resolved until the passage of the Colorado River Basin Project Act of 1968. This was the issue of whether the Arizona congressional delegation and the Bureau of Reclamation could secure authorization of the central Arizona project (CAP). And if so, what concessions would other States entitled to Colorado River water secure to protect their interests? The CAP was a 400-mile system of aqueducts, dams, and associated works. It was designed to divert 1.2 million acre feet (maf) of Colorado River water to central Arizona around Phoenix and

Tucson. Its purposes were to rescue an irrigated agriculture (producing feed grains, forage, cotton, vegetables, citrus, and other fruits) which had depended on declining groundwater supplies,⁶ and to provide municipal water. As finally passed, the Colorado River Basin Project Act authorized the appropriation of \$1.2 billion for the construction of the CAP and various other developments in the upper and lower basins (27). This was the largest reclamation program authorized in a single act of Congress since the Missouri basin project was authorized in 1944. It was understood that the Bureau would not ask for this program to be funded until the Vietnam war was over (28).

HR4671, as amended in early 1966, was the bill that had evolved from the Bureau's regional water plan of 1963. It was supported by all seven Colorado River States because it contained some feature wanted by each of them. But it also provided for two dams, one above and one below the Grand Canyon, that were bitterly opposed by the organized conservation movement. This opposition reached its apex in 1966, culminating in a letter writing campaign that informed contemporary observers described as among the largest they had ever seen (29).⁷ In addition, northwestern interests organized formidable opposition to the provision for feasibility studies of water importation projects. Spokesmen for the Governors of Idaho, Oregon, and Washington opposed interbasin water importation studies, pending completion of State studies of their own long-range water needs (30). Other Northwest spokesmen particularly opposed making the Bureau of Reclamation responsible for conducting these investigations. They argued that since the Bureau would get the opportunity to build the mighty engineering project that would result from a favorable report, it could not be trusted to make an objective assessment of whether or not such a project was economically and financially feasible (31).

⁶The Colorado River Basin Project Act provided that water from the CAP would not be made available for the irrigation of new lands except Indian lands and wildlife refuges.

⁷This campaign was partly the result of an indignant public's reaction to an action of the Internal Revenue Service that was considered to be unfair.

On June 9, 1966, the Sierra Club, a tax exempt, nonprofit organization, put a full page advertisement in the New York Times and Washington Post. This ad, headlined "Now Only You Can Save Grand Canyon From Being Flooded for Profit," urged readers to write their Congressmen and key members of the Administration and tell them to oppose the dams. The very next day the IRS warned the Sierra Club that since it was engaging in lobbying activities it might lose its tax exempt status. This warning and the announcement and ruling that followed became front-page news all over the country. It was compared to IRS rulings that profit-making corporations could deduct lobbying costs as business expenses and widely interpreted as Government persecution of the Sierra Club for altruistic efforts on behalf of the Grand Canyon.

In 1967, Interior Secretary Stewart Udall announced a revised development plan for the lower Colorado (32). It was designed to lessen the controversy created outside the Colorado basin by the 1966 version. This administration proposal called for authorization of the CAP without Marble Canyon Dam and without Hualapai Dam (as Bridge Canyon Dam was now called) unless the proposed National Water Commission should decide otherwise.⁸ Without the dams there would be no basin development fund. The power needed to pump water on the CAP itself would be obtained by Federal financial participation, in the form of prepayment for generating capacity, in a large thermal power plant. The thermal power plant had already been planned for construction at Page, Arizona, by a combination of public and private utilities.

The Udall proposal did not provide for water importation studies or for the guarantee of 4.4 maf annually of Colorado River water to California. Neither did it provide for the authorization of the five Colorado western slope projects sponsored by Representative Aspinall, only two of which had been favorably reported by the Bureau of Reclamation.

The Udall proposal was quickly supported by Arizonans and congressmen from the Pacific Northwest. Senator Jackson of Washington, chairman of the Senate Committee on Interior and Insular Affairs, introduced the Senate version of the administration bill (33). It was not, however, accepted by the much larger congressional delegation from California and the upper basin States, including Representative Aspinall of Colorado, the chairman of the House Interior Committee. These congressmen considered that the administration had sacrificed the concept of regional water supply planning and undercut the interstate compromises achieved during long years of negotiation (34).

As finally passed, the Colorado River Basin Project Act (35) excluded the now very unpopular Colorado Gorge dams⁹ and contained a 10-year ban on water importation studies. But in other respects it more closely resembled the House bill than the administration proposal.

The Act provided for authorization of the CAP, including Hooker Dam to serve New Mexico, reauthorization of the Dixie project in Utah (at a higher level of authorized funding), and

⁸A May 1965 letter of the Bureau of the Budget had recommended that the Colorado Gorge dams be dropped from the Colorado project legislation and that an independent National Water Commission be established to study the appropriateness of importing water into the Colorado, as well as other national water problems. An administration bill to create such a commission was introduced in 1966.

⁹Power needed to pump water on the CAP would be "pre-purchased" as Secretary Udall had proposed from the thermal power plant at Page, Arizona.

authorization of the Uintah unit of the central Utah project. It also authorized the five projects on the western slope of Colorado and directed the Secretary (who had not included them in his own proposal) to construct them so that they would be completed at the same time as the CAP. The act also included the hotly-contested guarantee that California's legal entitlement of 4.4 maf would not be diminished to supply the reservoirs of the CAP.

In addition, the act established a Lower Colorado River Basin Development Fund to pay for the CAP and the Dixie project and any future water augmentation works. This fund would include: all appropriations for the CAP and Dixie project; all revenues from the CAP and Dixie project; all revenues from the Boulder Canyon and Parker-Davis projects after they had paid out their own costs (but these revenues, amounting to 77 percent of anticipated basin development fund power sales, would be reserved for future water augmentation works); and all revenues from the Arizona-Nevada portion of the Pacific Northwest-Pacific Southwest power intertie, after other repayment obligations had been met.

Section 201 authorized the Westwide study. It directed the Secretary to undertake comprehensive reconnaissance investigations to develop a general plan to meet the future needs of the West (excluding, for a period of 10 years, studies of interbasin water importation). Another section provided that if the Secretary did eventually plan water importation projects, he must consider that all present and future water needs of the exporting States took permanent priority over those of the importing States.

Section 202 had been strongly opposed by committee members from the East and Northwest. It provided that satisfaction of the 1944 Mexican treaty guarantee of 1.5 maf annually to Mexico be considered an obligation of the United States and not the basin States. If any water augmentation project were constructed, satisfaction of the Mexican obligation would be given first priority and would be paid for by the Federal Government. Then, when such a project was in operation and contained 2.5 maf (sufficient water to satisfy the Mexican treaty obligation plus a liberal estimate of evaporation and other water losses), the States of the upper and lower basins would be relieved of their obligation to supply Mexico with water.

The passage of the Colorado River Basin Project Act resulted in the authorization of the central Arizona project, which the Bureau of Reclamation had originally planned in the 1940's and vigorously supported ever since. Nonetheless, the Bureau's expressions of triumph at its passage were muted. Bureau spokesmen admitted they were troubled about the amount of

water the CAP would actually supply (36). It was designed to divert 1.2 million acre feet of water that the Bureau considered to be needed. But the 4.4-maf California priority, the five Colorado projects, the Utah projects, and the prospect of further development in the upper basin meant that much less would be available. By the Bureau's own estimate, 1,105,000 acre feet would be available for the project in 1979 (the predicted first year of operation). By 1990, however, only 500,000 acre feet would be available. By 2030 (the last year of the project payout) only 284,000 acre feet would be available, unless the river were augmented in the interim (37).

When the act was passed, it seemed inevitable to many observers that the effect of the 10-year ban on interbasin importation studies would be temporary. Some observers were impressed by the great political strength of the seven Colorado River States (including populous California) compared to the three northwestern States. They considered that in 10 years' time the radically decreased water supply in the Colorado would surely lead to the formulation and implementation of plans to transfer Columbia basin water to the Colorado (38). But to others, the eventual transfer of Columbia basin water to the Colorado no longer seemed likely. It came to seem even less likely in 1969 and 1970. The preparation of State water plans by the northwestern States showing that they needed their own water (39), the continuing expansion of Columbia River hydrogeneration facilities (which might come to require most of the flow of the river) (40), the bitterness of environmentalist protests against the smaller diversions of the California State water plan (41), the increasing discount rate, and NEPA requirements were among the factors that made this seem an idea whose time had passed. The Bureau still believed that augmentation was necessary to solve the water problems of the Colorado, but was now inclined (after a brief flurry of interest in desalination of sea water) (42) to look to weather modification as the way to achieve it (43).

Another problem of the CAP was the problem of how the Lower Colorado River Basin Development Fund would be able to repay reimbursable construction costs without the assistance of "cash register" hydrodams. Secretary Udall told Congress that irrigation water users could only pay about \$10 per acre foot. However, the excess of their obligation could be repaid either by charging municipal water users \$56 per acre foot, by a special property tax levied on land in the three-county project area, or by a combination of above-cost municipal water and a property tax (44).¹⁰

¹⁰A solution incorporating a property tax on the project area seemed most probable. Phoenix was then paying \$3 an acre foot and Tucson \$9 for water
(Continued)

The Missouri River Basin Project

Until the late 1960's, the principal exceptions to the rule that reclamation projects were started soon after they were authorized were the irrigation units of the Missouri River basin project. These units had originally been authorized in the Flood Control Act of 1944 on the basis of the reconnaissance level Pick-Sloan plan (45). Subsequent investigations, and in some cases construction, had uncovered difficulties with soil conditions, hydrology, economic and financial feasibility, and (in the case of two large projects) political opposition (46). As a result, the implementation of irrigation developments authorized in the Pick-Sloan plan lagged behind navigation, flood control, and power developments (47).

In 1964, Congress enacted legislation requiring that any "unstarted" Reclamation Bureau project in the Missouri River basin plan be reauthorized before it could be started (48). This was done on the grounds that the individual projects of the 1944 plan required restudying to determine economic and financial feasibility. However, the Bureau and the two congressional authorizing committees agreed with the congressional delegations of the upper Missouri basin States that the requirement of reauthorization brought into focus a problem of interregional equity. Irrigation was the principal program benefit to the upper basin States that had contributed large acreages of good quality farm land to the building of reservoirs to protect the lower basin States from floods (49). For this reason, the Bureau and the congressional authorizing committees gave considerable priority to upper basin developments in the latter half of the decade. They were also influenced by the idea that the upper basin was losing population and would consequently benefit from the community-building effects of irrigation development (50, 51).¹¹

This argument was also made by proponents of irrigation development in other river basins. It was asserted among others

(Continued)

from existing sources of supply that were still a long way from exhaustion. It was therefore debatable that these cities would be willing to contract for CAP water at much higher rates in the early years of project operation. Indeed, if legal barriers to municipal purchase of agricultural water rights to other sources of water supply were removed, these cities might never be willing to contract for significant quantities of CAP water.

¹¹In the last years of the decade, Bureau spokesmen pointed to the soon to be started upper Missouri basin projects as the type of rural development that could help reverse the trend toward large urban concentrations. They believed that reclamation projects in areas of increasing farm size and decreasing farm population could (by providing new opportunities in family farming, services, and food processing industries) increase population and lead, in time, to the development of new cities and towns. This was expected to assist in the solution of the problems of great metropolitan areas that were then so high on the national agenda. See (50).

by advocates of upper Colorado basin irrigation projects (authorized in the late 1950's or early 1960's, but still unstarted in 1970) and proponents of unauthorized projects on the Snake and Salmon Rivers (that had been sidetracked for environmental reasons).

Thus, the initial stage of the Garrison diversion unit in North Dakota (which had been bitterly attacked as creating surpluses) was authorized in 1965 (52). The Nebraska mid-State division was authorized in 1967 (53), and the Oahe unit, James division in South Dakota, was authorized in 1968 (54). Use of project water for the production of the basic surplus crops whose price was supported by the Commodity Credit Corporation was forbidden in all three authorizing acts for a period of 10 years after enactment (55).¹²

The Garrison diversion was started in 1970 and the Oahe and Nebraska mid-State projects were scheduled for starting early in the 1970's. All three of these projects would be largely financed by power revenues in the Missouri River basin account.

The Central Valley Project

By the end of the 1960's, it was apparent that the decline in national support for both irrigation and water development was restricting projected growth of California's large and prosperous Central Valley project (CVP).¹³ The CVP units under construction or consideration during the latter 1960's were coordinated with the California State water project, which was designed to carry water from the humid northern part of California to arid southern California. These units were heralded by the Bureau as exemplifying farsighted regional multiple-purpose water planning, Federal-State cooperation, excellent benefit-cost relationships, and grass roots participation (56). Nonetheless,

¹²This restriction applied to wheat, corn, cotton, tobacco, and (after Agricultural Act amendments in 1970) to feed grains, but not to sugar beets or dairy and livestock products. Since wheat, corn, and feed grains had been grown in the project areas, this would have been a substantial restriction on water use if it dated from the provision of water service, rather than the date of enactment. As it was, it seemed probable (because of time lags between authorizing and completing projects) that the 10-year restriction would expire before the projects were in operation.

¹³The CVP, whose initial units were authorized in 1935, was described by the Bureau in 1969 as an expanding project, only half completed. It consisted of multiple-purpose dams (with powerplant revenues pooled in a basin account) and water delivery systems that emanated from the Sacramento and San Joaquin Rivers and their tributaries and served more than a third of the State. With the completion of the San Luis unit, the CVP would also carry State project water to the State's California Aqueduct for conveyance to southern California. The CVP was by far the largest reclamation project in terms of value of crops produced and the second largest in terms of project area. It delivered about 4.9 maf of water annually, of which 4.7 maf was for irrigation of land subject to reclamation program acreage limitations and the rest for municipal and industrial water and wildlife conservation.

authorized projects encountered funding difficulties (57) and, in the last years of the decade, efforts to authorize additional units were thwarted (58). This occurred not only because of budgetary constraints on public works generally, but because of the lowered priority of irrigation works (59) and environmentalist protests.

Environmentalist protests generated by the construction or proposed construction of units of the CVP were of two kinds:

One was that facilities intended to maintain water quality or divert water in the valley would seriously damage the ecology of San Francisco Bay and the Sacramento-San Joaquin Delta. The San Luis drain, which was under construction during this period, was opposed because (unless adequate treatment facilities were planned and constructed) it would carry grossly polluted agricultural return waters away from the San Joaquin Valley and discharge them into San Francisco Bay (60). There was also organized opposition to the proposed authorization of the State-Federal peripheral canal. The peripheral canal would divert a large part of the flow of the high quality Sacramento River out of the bay, where it was believed to be needed to maintain salinity balance for fish life and to dilute sewage. Instead, it would send the water into the highly polluted San Joaquin River to maintain water quality in wildlife areas of the delta and in the water carried to southern California by the State water project (61).¹⁴ Authorization of the proposed eastside division was also opposed on the grounds that it would divert so much water from the delta for irrigation that it would "destroy" the fresh water supplies needed for wildlife in the delta and for outflow into the bay (62).

The other environmentalist objection to the CVP centered on the planned interbasin expansion of CVP developments into the northern coastal rivers of California. Bureau projections of water demands were based on requirements for continued population and economic growth. They showed that the Central Valley would need an additional 5 to 6 maf of water annually for irrigation and other purposes over the next 25-30 years (63). Planned developments in the valley could only provide a small part of this supply. Consequently, the Bureau proposed a comprehensive multiple-purpose interagency plan to meet the needs of northwestern California (mainly for flood control) and transport millions of acrefeet of surplus water to the Central Valley (64). This would require building dams on undeveloped sections of the Eel, Klamath, and Trinity Rivers, which the

¹⁴The peripheral canal was opposed by some environmentalists but supported by others (with the provision that its authorization must be accompanied by guarantees of adequate minimum releases to delta channels).

organized environmental movement was now determined to preserve in their natural states (65).

In addition, the CVP was criticized for its cooperation with and integration into the California State water project. In the early 1960's, the State water project had been widely praised for its farsightedness in providing the water supplies needed for anticipated population and economic growth in the Los Angeles-San Diego area. In the late 1960's and 1970, it was bitterly criticized for "pumping more water and hence more people, into an area already short of precious air" (66).

The Power Program

It would be saying too much to assert that this was the period when the Bureau finally gave up its 35 years of dedication to the development of hydropower for the purpose of achieving regional economic growth. The great third powerplant of Grand Coulee Dam, the largest electric power project the Bureau had ever attempted, was justified when authorized in 1966 largely on the basis that it would assist industrialization in the Northwest (67). The "cash register" dams of the upper Colorado were built during the 1960's, although planned in the 1950's, in order to pay for the expected agriculture-based growth of the region. This was also the case with the Yellowtail Dam and power plant, which was expected to produce a small but significant part of the revenues in the Missouri basin account (68). Furthermore, the leading irrigation developments that were authorized or up for authorization in this period (apart from CAP) were expected to be largely paid for by power revenues. However, these power revenues would usually not emanate from the new developments themselves, because new irrigation units usually generated little power beyond what was needed for pumping the irrigation water. Instead, these revenues would come from basin accounts pooling power revenues received from projects that, except for the third powerplant, were planned in the 1950's or earlier.

However, this period did demonstrate the advancement of a change in approach to hydro development that had been slowly coming to pass. With the outstanding exceptions of the third powerplant and the two dams proposed for Grand Canyon, Bureau hydro developments planned in the 1960's were mainly low factor plants. They were designed to pump water on the project and to generate a small amount of peaking power to be connected with nonfederal thermal power systems. This was because of diminishing costs of thermal power production and increasing scarcity of sites with the topography and hydraulic

conditions necessary for economic hydro production. By the 1960's, it was obvious that large new hydro developments were not efficient (69).¹⁵

Furthermore, the successful environmentalist opposition to the dams in Grand Canyon (and to Ramparts Dam in Alaska) demonstrated that even "good" new sites probably could not be used. The advantage of the third powerplant was that no new site was required.

Apart from early stages of the third powerplant, the Bureau's principal power development efforts in the second half of the decade involved power transmission. In the late 1960's, the Bureau continued to participate in construction of the regional and interregional public-private, thermal-hydro, high voltage power lines begun in the early 1960's. The largest of these transmission systems, and the one for which the Bureau built the most line, was the great interregional, intergovernmental, interagency Pacific Northwest-Pacific Southwest intertie, which linked public and private electric systems from Seattle to Los Angeles and Phoenix. This intertie made it possible for north-western generating capacity, which was much greater than the existing needs of the region in the summer, to be used to supply the Southwest with power for air conditioning. It allowed utilities in both the Northwest and Southwest to meet peakloads with less plant investment (70).

In addition, the Bureau participated in construction of a smaller connecting system that tied together an even larger transmission network than the Pacific intertie. This was the east-west interconnection achieved in 1967 by a linkage of all interconnected eastern and western utility lines at three Bureau and one Corps of Engineers power installations in the Missouri basin project (71). A year later, a committee representing the Bureau and two other Interior Department power marketing agencies completed transmission study 190, a reconnaissance level planning study of the power potentials and needs of the western States (72, 73).¹⁶

Power facilities constructed by the Bureau in the late 1960's were built with more attention to aesthetic considerations than

¹⁵The obviousness of this conclusion was aided by the measure the Bureau used to evaluate hydropower benefits: the cost of power from the most economical alternative. This was a much more conservative measure than the one used to evaluate irrigation benefits (increased net farm income due to irrigation).

¹⁶Although the Bureau's power transmission system construction program declined at the end of the decade from its high point in the mid-1960's, this program appeared to at least one knowledgeable observer to have great potential for expansion. William E. Warne, a former high official of both the Bureau and the Interior Department, suggested in the early 1970's that, as the Bureau's irrigation activities tapered off, the agency should devote its engineering expertise to constructing an interregional power grid. See (73).

had previously been the case. Power was conveyed from generators to switchyards in cables in oil-filled underground pipes, instead of overhead cables, first at Yellowtail powerplant, then at the Curecanti unit in the upper Colorado (74). Then, when the switchyards for the two existing power plants at Grand Coulee were consolidated to make room for the third powerplant, underground cables were used to bring the power to a new low-profile consolidated switchyard (75). At the end of the decade, spokesmen pointed to developments in underground transmission systems and powerplants and low-profile substations as an important part of the Bureau's environmental program (76).

The Third Powerplant of Grand Coulee Dam

In 1966, Congress authorized an enormous power project (77) that had stronger administration support than any other Bureau of Reclamation project in this period (78). It also had no political opposition from any interest group (79, 80)¹⁷ and a benefit-cost ratio of more than 3 to 1 (81). This was the third powerplant of Grand Coulee Dam, designed to add 3.6 million kilowatts of annual generating capacity to Grand Coulee's existing 2-million-kilowatt capacity. It would make this New Deal public works project, once again, the world's largest single hydro development as it had been when it was originally completed. Appropriations of \$390 million were authorized for this project.

The third powerplant was the key element in the plan to make the most effective use of improved stream flow regulation resulting from the Columbia River Basin Development Treaty, ratified in 1964. Under this treaty, Canada agreed to build three storage dams (two were already under construction) and the United States was permitted to build Libby Dam in Montana, which would back water 42 miles into Canada. Controlled releases of an additional 20 maf of water storage would make it possible for the United States to add power generation facilities at various dams on the river. Grand Coulee was the most economic site for developing most of this power because of its

¹⁷Although there was no opposition to the powerplant itself, this was not true of section 2 of the authorizing act. Section 2 gave statutory authority to the existing administrative partial basin account for the Columbia and extended its assistance to future irrigation projects. Furthermore, it directed the Secretary of Interior to raise Bonneville Power Administration rates, if existing revenues were insufficient to provide such assistance. This section had been inserted in the act by the irrigation-oriented House Interior committee. It aroused fears in the power-oriented Senate committee that large numbers of new irrigation projects, requiring such assistance might be built, throwing an unfair burden on the purchasers of electric power in the Pacific Northwest. These fears were allayed by the passage of legislation later in the year to regulate the timing and limit the amounts of financial assistance that could be provided to Columbia basin irrigation projects from Federal hydro revenues. See (80).

location, height, large reservoir capacity, and the regulation of river flows by the Chief Joseph Dam immediately below it (82).

In addition, the third powerplant would make possible efficient use of the Pacific Northwest-Pacific Southwest intertie, then under construction. It would permit marketing secondary and peaking power (surplus to the needs of the Northwest) in the power-hungry Southwest (83). Shortly after authorization of the project, the Secretary of the Interior announced plans to install the authorized 3.6 million kilowatts in the form of six 6-megawatt generators¹⁸ (larger than any previously fabricated). The first three were to be installed and producing power in the mid-1970's; the second three, as power needs required, but no later than 1982. The powerplant was to be designed so that three more 6-megawatt generators could be added later, if needed and authorized by Congress (84).

Construction activities began in 1968. At the same time, the Bureau announced its intention to prepare a comprehensive environmental plan for the facility and surrounding area. The world-renowned architectural firm of Marcel Breur and Associates was hired to design the architectural features of the project. A second architectural firm was hired to prepare a plan to upgrade the publicly and privately controlled environment of the surrounding community and fully develop its scenic and recreation potential (85). This plan was to be formulated with the participation of representatives of Federal, State, and local agencies and citizens organizations (86).

Municipal and Industrial Water

In response to water demand projections and changes in national policies, the Bureau's policy statements and program descriptions throughout this period drew attention to the growing importance of its M and I water activities (87). The Bureau's annual reports showed that M and I and other nonagricultural water supplied from Bureau projects increased from 504 billion gallons per day (bgd) in 1965 to 666 bgd in 1970 (88).

Although M and I deliveries increased significantly during the second half of the decade, most of this increase was attributable to the urbanization of irrigated acreage in older projects. It was not caused by new construction for the specific purpose of meeting M and I needs. The only new facility among the 12 leading projects providing M and I water service in 1970 was the Canadian River project in Texas, which made its first deliveries in 1967 (89). During the Johnson administration,

¹⁸One hundred thousand kilowatts is sometimes referred to as 1 megawatt. These six generators were to be 600,000 kilowatts each.

M and I projects, such as the southern Nevada water supply project had the same difficulties obtaining funding as predominantly irrigation projects (90) and there were more irrigation projects.

This situation changed in the last 2 years of the decade, in response to considerable prodding from the Bureau of the Budget. In 1969 and 1970, policy statements concerning the increasing importance of M and I water came to mean that where other considerations were equal, authorized projects with substantial M and I features would be started sooner and completed earlier than irrigation projects (91). At the end of the decade, as already noted, Nixon administration officials stated that it seemed likely that projects meeting the M and I water needs of the West would be one of the mainstays of the new "people-oriented" (rather than land-oriented) reclamation programs of the 1970's (92).

Small Reclamation Project Act

Since the passage of the Small Reclamation Projects Act of 1956, the Secretary of Interior was authorized to contract with local organizations to provide loans¹⁹ to construct or rehabilitate small irrigation projects. These projects were also permitted to include some provision for other reclamation project purposes. The total cost of each project was limited to \$10 million. As in the case of the small watershed program, authorization by act of Congress was not required for individual projects, but loan applications approved by the Secretary were also sent for approval to the appropriate congressional committees, in this case, the House and Senate Interior Committees (93).

The 1956 enabling act had authorized the appropriation of only \$100 million for this entire program. Since all of this amount was spent by 1966 (94), Congress raised the authorization to \$200 million, so that the program could continue. The 1966 act also made several minor changes in the program. It raised the maximum financial assistance for a single project from \$5 million to \$6.5 million, and provided that recreation and fish and wildlife enhancement features, for which Federal money was given, be governed by the cost-sharing rules established by the Federal Water Project Recreation Act of 1965. It also lowered the discount rate on interest bearing portions of

¹⁹He was also authorized to make grants for purposes that were non-reimbursable under reclamation law. But these amounted to a very small percentage of total financial assistance.

future loans²⁰ from the yield rate of long term government securities to the coupon rate, which was used in the regular reclamation program by provision of the Water Supply Act of 1958 (95).

While the 1966 legislation was in process, the Johnson administration made it known that it favored eliminating requirements that loans be approved by the two congressional Interior Committees prior to submittal to the two Appropriation Committees for funding. The Administration believed this requirement, as well as provisions for "committee legislation" in other small water projects programs, violated the separation of powers between the executive and legislative branches (96). The Budget Bureau also objected to the 1966 act's substitution of the coupon interest rate for the higher, current yield interest rate, because it considered the coupon rate to be an inadequate measure of the cost of Treasury borrowing to finance government loans (97). But Congress rejected executive branch suggestions and passed the act without changes, and the President signed it.

It soon became apparent, however, that the passage of the act would not be sufficient to continue the small projects program in the face of Johnson administration objections. In January 1967, the Secretary of Interior sent Congress a draft bill that would change section 4(d) of the Small Projects Act to no longer require project approval by the House and Senate Interior Committees. The Secretary advised Congress at the same time that he would not transmit any small project loan applications to Congress until this change was adopted (98). The administration bill was passed by the Senate but rejected by the House, with the result that no new loans were made for small projects in the last 2 years of the Johnson administration and the first year of the Nixon administration (99).

Furthermore, about this time, the Bureau rejected a number of loan applications on the ground that the proposed projects, because of increasing urbanization, could not be expected to remain irrigation projects for the entire 50-year payout period (100).²¹

After the change of administrations in 1969, however, the Nixon administration was not interested in continuing its predecessor's quarrels with congressional authorizing committees on the subject of separation of powers (101). Of perhaps

²⁰As in the regular program, repayments of the cost of providing irrigation water to 160 acre tracts were interest free, whereas M and I water and power costs had to be repaid with interest. But the Small Reclamation Project Act also permitted financing the irrigation of excess lands (which the regular program did not), provided that the costs attributed to the excess lands were repaid with interest.

²¹The statute required that more than 50 percent of the benefits be for irrigation.

more significance, by 1970 the Bureau of the Budget (now renamed the Office of Management and Budget) concluded that loan program projects, with their smaller impoundments and shorter water distribution systems, were more readily justifiable on both economic and environmental grounds than regular program projects (102). Furthermore, the new administration rejected its predecessor's insistence that projects must remain primarily irrigation projects, for the entire 50-year payout period. The Nixon administration believed this policy was inconsistent with new national policies deemphasizing land development for farm production and emphasizing recreation, fish and wildlife, and M and I water (103).

In 1970, the Bureau resumed the program and dropped the requirement that projects remain irrigation projects throughout the payout period. The Bureau transmitted 13 projects to the two Interior Committees for approval, and cleared the way for all of them to be placed high on the list of projects to be soon started (104). In addition, in 1970, a Senate bill to increase the program's appropriations authorization to \$300 million was introduced with bipartisan congressional sponsorship and administration support. The Senate bill would transform the program from an irrigation program to a fully multiple-purpose program. This bill would also, in recognition of inflation, raise the cost of projects eligible for financial assistance to \$15 million and the maximum that could be lent and granted for a single project to \$10 million (105).

Planning

The Bureau's planning program grew and changed emphasis in the latter half of the 1960's. Assistant Secretary of Interior Smith informed the House Appropriations Committee in 1970 that feasibility investigations (studies needed to justify project authorization) had decreased from 68 percent of the Bureau's planning budget in 1966 to 35 percent of its proposed budget for 1971 (106).

The rest of the Bureau's planning at this time was of three types:

- (1) Regular reconnaissance and basin studies to determine whether potential projects had sufficient merit to justify further study.
- (2) Assistance to State water resources agencies in preparing their own statewide reconnaissance level water plans. Western States were beginning to use WRC State planning grants for this purpose (107).
- (3) Participation in type I and type II interdepartmental comprehensive basin plans, under the aegis of the WRC.

The type I studies that the Bureau participated in during the 1960's (and was still participating in at the end of 1970) were for the Columbia North Pacific, California Region, Great Basin, Lower Colorado, Upper Colorado, and Missouri Basins—in other words, most of the reclamation West. These were “framework” studies on an even more preliminary level than the Bureau's own reconnaissance studies. The agency's contribution to the type I studies consisted principally of making projections of water and land resource availability, and demands for water and related resources. The Bureau also participated in four type II studies for smaller areas, which provided both framework information and sufficient detail to serve as a basis for project authorization (108).

In 1970, the Bureau began a master reconnaissance study of the 11 westernmost contiguous States, which it expected to take 7 to 10 years to complete. This was the Westwide study, which has already been discussed in relation to its consideration of unconventional technologies to supply irrigation water. The Westwide study was not intended to duplicate the framework and reconnaissance planning programs underway at this time. Instead, it purported to evaluate and make use of the information developed in other Federal and State plans, especially the regional and subregional projections of population, income, employment, and production prepared for the type I and type II studies.²² A large number of Federal agencies and all 11 of the States participated in the Westwide study (109).

Another study that the Bureau embarked on in 1967, but did not complete during this period, was the western Texas and eastern New Mexico import project investigations. This has already been discussed as the only reconnaissance study the Bureau ever undertook of an interbasin water transfer across State lines. It was a pioneer venture in the concept of using M and I water revenues, rather than hydropower revenues, to finance irrigation developments.

The purpose of this investigation was to formulate and evaluate a large number of alternative plans for importing surplus water from the Mississippi River system to the High Plains of western Texas and eastern New Mexico and to provide M and I water. The Corps and the Mississippi River Commission were responsible for determining the availability of surplus Mississippi River flows, conditions under which such surplus flows could be diverted, and the best route and means of

²²These were prepared by the Office of Business Economics (Department of Commerce) and the Economic Research Service (Department of Agriculture) and were known as OBERS projections.

delivering them to a point near Dallas, Texas. The Bureau was responsible for planning for transport from that point to areas of need in the High Plains of western Texas and eastern New Mexico (110). The Bureau considered that the results of this study would not only be important to the future development of the study area but would yield important insights into the engineering, economic, and financing problems involved in long distance conveyance of large quantities of water. These factors included costs, water service schedules, repayment prospects, environmental impacts, and the problems of providing the enormous quantities of thermal electric power to pump and lift the water (111).

At the end of the decade, Bureau spokesmen were willing to concede that the main purpose of the Texas import study was to find out whether such projects were warranted and that the answer might very well be that they were not (112). However, the very idea of considering the merits of a project like this seemed to some critics to be objectionable. High population and economic growth for an adequately watered High Plains area, projected for this study by State universities and the Texas Water Development Board, were believed by these critics to be biased and an attempt to make a self-fulfilling prophecy.²³ The environmental effects of the most likely alternative projects were deplored, both with respect to the transport route and (especially) to the Mississippi's estuarial system (113). Not only the organized environmental movement, but lower Mississippi Congressmen (usually friendly to water resources development) were appalled at the possibility that a high cost project benefiting another area of the country would be permitted to worsen degradation of the bays and cause salt water intrusion along the Gulf (114). By 1970, passage of the NEPA and the likelihood that the WRC would soon adopt multiple-objective planning, with its counting of environmental benefits and costs, made it questionable that the import study, when completed, would result in recommendations for a feasibility study.

In late 1968 and 1969, the Bureau undertook and completed a prereconnaissance, "rough study" of the technical feasibility of another water importation project that had long been the object of engineering speculation. This was the California undersea aqueduct which would take water from the mouth of the Klamath, and perhaps other northern California rivers, and

²³But the projections of "economic doom" for the High Plains, if more water was not supplied, were not challenged with so much conviction. In this respect criticism of the Texas import project was different from criticism of the central Arizona project. Opponents of CAP amassed volumes of scholarly evidence that central Arizona would continue to prosper and grow even if there were no project.

deliver it to southern California by pipeline under the Pacific Ocean. This project would avoid many of the environmental problems associated with long overland diversions of large quantities of water but could cause other undesirable environmental effects.

The Bureau's prerreconnaissance report stated that such an aqueduct could probably be built at costs competitive with the costs of water delivered from other potential sources. The report recommended that the Bureau undertake a 5½-year reconnaissance study in two phases. Phase one, which would take about 3 years, was to consist of basic research to determine physical feasibility, including ecological effects and problems. Phase two was to consist of physical studies, design, cost estimates, economic analyses, study of alternative projects, and preparation of the final report (115).

Atmospheric Water Resources

Beginning with appropriations of \$100,000 in 1962, which increased in stages to \$3 million in 1966, the Bureau had been responsible for a small program of extramural research into the possibilities of augmenting water supplies by cloud seeding (116). In early 1967, Secretary Udall released a 1966 report on the proposed expansion of this program, entitled "Plan to Develop Technology for Increasing Water Yield from Atmospheric Sources." This proposal outlined a program of phased research and development leading to the achievement of capability to significantly increase precipitation in seven selected watersheds in the West²⁴ by 1975. (This would mean that streamflows in these watersheds could be augmented by perhaps 10 percent, at much less cost than by building aqueducts and dams.) The program was also expected to lead to the achievement of a general capacity to increase stream flows (when needed) in all regions by 1980 (117).

The Bureau asked for an appropriation of \$5 million to begin this expanded program, called "Project Skywater" in fiscal 1968. It received only a little less. However, appropriations for fiscal 1969, 1970, and 1971 were not raised significantly, even though it was now considered that a total investment of \$800 million, over a 20-year period, would be needed to accomplish the entire program (118). Detailed cost estimates given to the two congressional Appropriations Committees in 1968 outlined an ambitious nationwide program. This program included applied

²⁴They were located in Colorado, Wyoming, the southern Sierras, the central mountain region, the Northwest, the northern Great Plains, and the southern plains-gulf region.

engineering research and development; research into the legal, social, and ecological problems associated with weather modification; increasing precipitation directly onto parched soils and forests, as well as into streamflows; and performance of large-scale operational experiments in the seven western areas selected in the Plan to Develop Technology and also in the Great Lakes and Northeast. More than \$500 million of the estimated \$800 million total was expected to be spent on the large-scale operational programs (119).

During the years 1966-70, Project Skywater mainly consisted of research, development, and small-scale operational experiments performed under contract by universities, private research organizations, and State and Federal agencies (120). One of the most successful small-scale cloud seeding experiments was begun in 1966, in the watershed above Hungry Horse Dam in Montana. This experiment increased the water content of the winter snowpack an average of 10 percent annually for 4 years, with an increase of 26 percent in the 1969-70 season. It also resulted in the generation of \$12 million worth of extra hydropower at Hungry Horse Dam, in return for an investment of \$286,000 for weather modification research (121).

Another cloud seeding experiment, which was intended to achieve practical as well as scientific results, was begun in 1970 in the Truckee-Carson River Basin in California and Nevada. The purpose of this experiment was to increase inflow into Pyramid Lake on the Paiute Indian Reservation, to protect the historic fishing grounds of this impoverished Indian tribe and also help provide an adequate water supply for other water users in the basin (122).²⁵

In 1970, two large-scale pilot projects were begun which, if they succeeded in demonstrating the efficiency of their particular technologies, might lead to the establishment of permanent operational programs in the mid-1970's (123). The largest, a winter cloud seeding project covering a 3,300-square-mile area in the San Juan Mountains in southern Colorado, was begun in December 1970, after 2 years of planning, design, and instrumentation work. This project was expected to confirm the Bureau's findings (derived from smaller scale operations) that it had developed the methodology to augment Colorado River basin streamflows by 1½ maf annually, at a cost of about \$1 to \$1.50 per acre foot. The Bureau predicted that this pilot project

²⁵Pyramid Lake had been suffering a steady decline in water level as a result of existing diversion from the Truckee River for irrigation and power. Furthermore, additional diversions, which would result in even greater lowering of the lake level, were threatened by the terms of an as yet unratified interstate compact between California and Nevada.

would lead to an operational program with a benefit-cost ratio of ten to one (124).

The other large-scale pilot project begun in 1970 covered 2,500 square miles in North Dakota. It was an attempt to establish the economic feasibility of augmenting summertime precipitation in the Northern Plains (125).

7. THE SOIL CONSERVATION SERVICE

SCS's principal water resources program in the second part of the decade was the small watershed program, which consisted of two categories of projects. One was the 1,500 Public Law 566 projects already underway (1) (together with 7,500 potential additional projects considered to be needed) (2). The other was the 5 remaining "pilot watershed" projects for which money was first appropriated in 1953 (3).

Small watershed projects were comparatively modest enterprises. Their average Federal cost (most of the total cost) was estimated in 1970 to be about \$1.5 million per project (4). The agency was also involved in two programs of larger projects. One consisted of 10 of the original 11 larger watershed or "flood prevention" projects, authorized in 1944. The other was the new resources conservation and development (RC&D) program, which consisted of multi-county economic development projects involving integrated Federal, local government, and (especially) private investment (5). (Table 5 shows the appropriation levels of these programs for this period.)

Like the Corps and the Bureau of Reclamation, SCS entered the second part of this period with the expectation that its water development program would show the vigorous growth predicted for it at the beginning of the decade. This expectation was strengthened by the WRC's first assessment of the Nation's water resources. This assessment predicted that nationwide annual flood losses would increase from \$1.7 billion in 1966 to \$5 billion in 2020, and that three-fifths of these losses would accrue in the upstream areas protected by SCS programs (rather than the downstream areas protected by Corps programs) (6). The expectation was also strengthened by the Agriculture Department's 1967 update of its inventory of national soil and water conservation needs (this report was widely cited in program discussions, beginning in 1968, although not published till 1971). The updated inventory asserted that there were 8,904 watersheds smaller than 250,000 acres, in which small watershed projects were needed to meet flood prevention, agricultural

Table 5. Soil Conservation Service appropriations for water resources programs, fiscal years 1966-71

| Fiscal year | Water-shed planning | Water-shed protection ¹ | Flood prevention | RC&D | River basin development |
|------------------------|---------------------|------------------------------------|------------------|-------|-------------------------|
| <i>Million dollars</i> | | | | | |
| 1966 | 6.27 | 66.40 | 25.58 | 4.34 | — |
| 1967 | 6.34 | 70.13 | 25.75 | 4.66 | — |
| 1968 | 6.19 | 61.90 | 25.75 | 6.25 | 8.50 |
| 1969 | 6.42 | 57.90 | 24.22 | 6.37 | 9.09 |
| 1970 | 6.75 | 66.33 | 24.74 | 10.83 | ² 8.84 |
| 1971 | 6.59 | 78.34 | 21.98 | 14.95 | ² 9.76 |

¹ Includes small watersheds program appropriations for construction, administration, loans to sponsoring organizations, and (until fiscal 1968) river basin planning and inter-agency coordination activities. In 1966, the river basin program appropriations item was \$5.88 million; in 1967, it was \$7 million. ² Includes flood hazard analysis. Appropriations for flood hazard analysis were \$59,000 in fiscal 1970 and \$154,000 in fiscal 1971.

Source: Department of Agriculture, Budget Explanatory Notes, Vols. I, 1967-72, Vol. III, 1973.

water management, and nonagricultural water management needs (7).

SCS prepared for its expected larger future program by encouraging local organizations to apply for planning assistance and States to make their own sizable appropriations for watershed planning (8). In addition, the agency requested more construction funds than the Bureau of the Budget was willing to permit (9). However, by the end of fiscal 1970, only 1,066 watershed plans were completed, 724 construction starts made, and 293 projects completed (10). Since the rate of authorizations for planning assistance in fiscal years 1968 and 1969 was about 100 a year¹ and the rate of project completion was only about 40 a year (11), a considerable project backlog developed during this period. The National Association of Soil and Water Conservation Districts (NACD) pointed out that, at this rate, SCS could not complete its task of providing currently needed watershed protection works until the middle of the 21st century. NACD urged the doubling of both planning and construction funds (12).

¹ But this imbalance between planning and construction, which had been deplored by the Senate Appropriations Committee, was stopped by the Nixon administration. In fiscal 1970, only 50 new watershed planning starts were made; in fiscal 1971, only 60—thus reducing the planning activity to a level comparable to that of construction.

Executive Branch and Congressional Policies

Many of the same factors that impeded the growth of the much larger Corps and Bureau of Reclamation water development programs in this period also inhibited the growth of the small watershed program. Like the programs of the larger water development agencies, the small watershed program had to compete for funding with the Vietnam war, the "war on poverty," space exploration, and sewage plant construction. Like the larger water development programs, the watershed program encountered opposition from the environmental movement (although only to its channel improvements program and not until the last years of the period).

Like the reclamation program in particular, the watershed program lost some of its previous standing with the executive branch as a result of the recommendations of two Johnson administration advisory commissions² that all Federal land development programs to increase farm production capacity be terminated (13). In addition, the watershed program was probably adversely affected by two other attitudes of the Johnson administration: (1) an apparent skepticism that the rapidly declining need for people to operate farms could be reversed; and (2) a belief that the best way to alleviate rural poverty was to provide more opportunities "for those rural families that don't farm or can no longer look to farming as their sole source of income" (14).

SCS accommodated the changing emphases of executive branch policy by integrating its watershed program in Appalachia into the Appalachian regional development program and intensifying its planning and project installation operations there (15). It also promoted the rapid extension of its new industry and recreation development-oriented program, the RC&D program (16). RC&D projects were based on larger regions defined by economic problems rather than physical units, and normally included one or several P.L. 566 projects, as well as other small-scale water-oriented developments. RC&D projects increased from 3 at the end of fiscal 1965 to 55 at the end of fiscal 1970 (17).

In addition, SCS issued new policy guidelines to its staff in 1967 to tighten existing restrictions on increasing crop production on watershed projects and explain USDA and BOB preferences for projects that served other purposes. These preferred purposes were (1) depressed area development, (2) recreation, and (3) overall environmental improvement (18).

²The National Advisory Commission on Food and Fiber and the National Advisory Commission on Rural Poverty. See chapter 6 for discussion of recommendations of these commissions.

Watersheds memorandum 84 provided that henceforth SCS would not be permitted to approve any watershed plans in which benefits accrued *primarily* from bringing new lands into production by any means. Previously, this restriction had applied only to irrigation and drainage measures, but now it became applicable to the flood prevention measures which accounted for more than three-fourths of total project costs. In addition, SCS would not approve any watershed work plans that depended for economic justification on increased production of surplus crops.³

Furthermore, project sponsors were to be encouraged and given assistance to convert cropland devoted to production of surplus crops to other uses, such as recreation, wildlife, and production of nonsurplus crops.

In addition, watersheds memorandum 84 assigned the highest priority to multiple-purpose projects providing combinations of watershed protection, flood prevention, recreation, fish and wildlife enhancement, and M and I water quality management.

The watersheds memorandum and its supplement plainly stated that the reason for SCS's assignment of priority to multiple-purpose projects was the unacceptability to USDA and the Johnson administration of projects whose most obvious effect would be to increase farm production. But SCS continued to be restricted in using the program to promote such clearly non-agricultural, administration-favored purposes as recreation, wildlife, and M and I water. This restriction stemmed from the basic purpose of the Watershed Protection and Flood Prevention Act (as P.L. 566 was officially titled). This law was primarily intended to provide solutions for erosion, sedimentation, and flooding problems. For this reason, the act provided much more Federal assistance for flood protection (defined to also include sedimentation control) than for other purposes. Furthermore, in August 1967, the Chairman of the House Agriculture Committee reasserted the basic policy of the act and announced that the committee would only approve projects whose primary purpose (the purpose requiring the largest part of the project costs) was flood prevention.⁴ Other purposes, whether agricultural or non-agricultural, were declared acceptable "if consistent with good soil and water management" but were considered "incidental" (19).

³This directive was not to be applied in Appalachia and other depressed areas, such as those designated under the Public Works and Economic Development Act of 1965. In these areas, increasing income of low-income farms was to be the overriding goal.

⁴In determining the primary project purpose, channel improvements serving "an inseparable combination of drainage and flood prevention" were considered flood prevention improvements.

Congressional committees responsible for approving watershed projects and appropriating money for them were enthusiastic supporters of the program in its original guise as a flood control program, principally for the protection of farmland. Members of these committees agreed with the Johnson administration that it was necessary to restrain domestic expenditures during the Vietnam war to control inflation. But they were not greatly impressed with the other considerations that led the BOB to hold down the total number of projects during this period and to award priority to those that served such goals as depressed area renewal and recreation. To a large degree, the committees did not agree with BOB that increasing farm production capacity and protecting the agricultural land base to make future increases possible were matters of indifference to the Nation (20). Furthermore, many committee members asserted that small watershed projects had already proved their effectiveness as a means of community economic development, and that they considered the anti-poverty and depressed area renewal programs (more favored by the Johnson administration) to be dubious experiments (21). Especially toward the end of the period, these committees were strongly impressed with the contribution of land treatment measures and sediment traps on P.L. 566 projects to the national water pollution control effort (22).

Consequently, the House Agriculture Committee during the Johnson administration consistently approved more watershed work plans than could be accommodated by the proposed budgets for new starts or the (usually larger than budgeted) amount that was actually appropriated (23). This remained true, even though the average annual expenditure on each project declined drastically in this period (24). The two appropriations subcommittees were not at that time prepared to fund the program at the \$200-million-a-year level recommended by the Chairman of the House Agriculture Committee (25), but they did override the Budget Bureau and insist on funding the program at the previous year's level, when the agency's proposed budget was drastically reduced (26). In fiscal 1968, the administration impounded some unrequested watershed appropriations, first administratively and later under anti-inflationary legislation (27).

Another dispute between the Johnson administration and congressional committees concerned the constitutionality of the "committee approvals" provision of the Watershed Protection and Flood Prevention Act. Under this provision, no appropriation could be made for projects involving a Federal investment of \$250,000 or more unless plans were first approved by resolution of the appropriate congressional committees (the

House and Senate Agriculture Committees for projects containing no single structure with more than 4,000 acre feet capacity and both Public Works Committees for projects with larger structures) (28). This dispute was similar to the administration's quarrel with the House and Senate Interior Committees concerning a similar provision for committee approval of projects in the Small Reclamation Projects Act.

In early 1966, BOB announced that it would not forward certain watershed work plans that SCS had sent for executive branch review to the congressional committee responsible for approving the projects. The Bureau explained that this refusal was not based on disapproval of the projects on an individual basis but because the President had taken the position that "committee legislation" was a violation of the doctrine of separation of powers. Congress was urged to change the Watershed Protection and Flood Prevention Act so that it provided either that all projects be authorized by act of Congress or that the Secretary be authorized to proceed to the appropriations stage without prior approval by the "substantive" committees. In the latter case, the Bureau suggested that statutory provision could be made for the substantive committees to continue to review the projects, for the purpose of advising the Secretary or the Appropriations Committees, or preparing legislation.

Subsequently, BOB sent these projects to the substantive committees, where they were quickly approved. But SCS was not permitted to furnish them with preconstruction land treatment and engineering services (29). The fate of these projects (there were 95 of them by the end of the Johnson administration) became intertwined with the Johnson administration's impoundment of appropriated construction funds under P.L. 91-213. This impoundment delayed new construction starts on a number of projects that had been approved before the constitutional question was raised. As a result, the projects that were held up for constitutional reasons would not have been in line for new construction starts, even if SCS had begun its usual preconstruction operations on them (30).

In this case, as in the case of the small reclamation projects program, the Nixon administration was not interested in pursuing its predecessor's constitutional quarrels with Congress. Soon after the new President assumed office in 1969, he announced that he had no objections to the committee approvals procedure, and SCS began preconstruction operations on the 96 projects (31). At about the same time, the Nixon administration decided to release all impounded small watershed construction funds (32).

The new administration, in its first 2 years of office, was less inclined than its predecessor had been to look to the watershed

program as an area in which to cut out "unnecessary" spending. Perhaps this was because the new administration was not impressed by the usefulness of the small economies that could be achieved by slowing down the progress of such a modest and comparatively uncontroversial program as this. It is also probable that the Nixon administration's policy of rejecting the "war on poverty" orientation of Johnson and Kennedy administration rural economic development programs, its preference for decentralization of government decision-making, and awareness of the potential of the watershed program for water pollution control all figured in its favorable view of the program (33).⁵

But although the Nixon administration was willing to permit the watershed program a certain amount of growth (it not only released impounded funds but agreed to slightly higher appropriations), it did not approve of the backlog of planned projects that had been growing during the second half of the 1960's. It therefore requested and received from the congressional Appropriations Committees fewer new planning and construction starts for fiscal 1970 and 1971 than the House Appropriations Committee had been willing to accept in previous years or than SCS had previously thought was a desirable level. The new administration wanted SCS to concentrate its energies on completing projects (34).

Relationship to the Environmental Movement

Until the last few years of the decade, relationships between SCS and the organized conservation movement were excellent. The big dams, long aqueducts, and canals of the Corps and the Bureau of Reclamation were under heavy environmentalist attack, but the land treatment measures and small impoundments of P.L. 566 projects were not. Instead, environmentalists saw them as ecologically sound alternatives to meet flood control, recreation, and water supply needs, while at the same time preserving the fertility of the soil, keeping sediment out of streams and lakes, and protecting the rural landscape from the ugly marks of erosion and sedimentation (35).

⁵These points of view were expressed in the March 1970 report of President Nixon's task force on rural development which also recommended "accelerated annual appropriations to develop more watersheds each year and to provide adequate funds to complete the projects within the estimated work schedule." The views of the Nixon task force were not so different from President Johnson's Rural Poverty Commission, however, in emphasizing the need for non-agricultural rather than agricultural rural development. The task force specifically urged that the watershed program be used to expand M and I water supplies and enhance recreation.

Conservationists tended also to appreciate the participation of elected officials of soil and water conservation districts and other local government units as sponsors in planning a project. They favored this participation in part because it had the effect of eliminating or minimizing the involuntary relocations that frequently occurred as a result of Corps projects, for instance (36).

In the 1960's, the environmental reputation of SCS was further improved by the development of "urban fringe" and frankly suburban watershed projects in major metropolitan areas. These projects, which used farm-type soil conservation measures to solve problems of runoff, erosion, sedimentation (and consequent water pollution) caused by massive suburban building, brought SCS into alliance with the local planning and good government organization people who were becoming active in the environmental movement at this time (37).

The Channel Improvements Controversy

However, beginning in about 1968, State fish and wildlife agencies and local rod and gun clubs began to raise stronger and more effective objections than they previously had to one type of structural measure used in watershed projects. These objections were taken up by the U.S. Bureau of Sports Fisheries and Wildlife (BSF&W),⁶ by its superiors in the Department of Interior, and by national conservation organizations (38). This controversial structural measure was channel improvement or "channelization." This is the modification of both natural and previously altered streams to improve their carrying capacity for flood prevention, drainage, or a combination of both. (There were also noncontroversial channel improvements for soil erosion control.) In some cases, channel improvements for flood prevention and drainage were limited to clearing and snagging areas of streams to remove large impediments to waterflow. Most of them, however, also included excavating larger areas to deepen, widen, and straighten the stream and clear vegetation from its banks (39).

⁶BSF&W reached its conclusions largely on the basis of the reports of the State agencies because it did not have the funds to perform its own wildlife investigations of P.L. 566 projects. The Fish and Wildlife Coordination Act of 1958 required that water development agencies consult both Federal and State fish and wildlife agencies on the effects of proposed Federal projects and authorized transfers of funds from the construction agencies to the Federal agency to perform the required investigations. But this did not apply to P.L. 566 projects, which were considered to be "federally assisted" rather than Federal projects. Instead, section 12 of the Watershed Protection and Flood Prevention Act provided that the Secretary of Agriculture inform the Secretary of Interior of the initiation of watershed planning studies so that the latter could make wildlife investigations if he chose to. The entire cost of such investigations had to be borne by the Interior Department and recommendations for fish and wildlife mitigation or enhancement measures were incorporated in watershed work plans only if acceptable to both SCS and local sponsors.

SCS's Watershed Protection Handbook specified that where the topography permitted, channel works were to be considered a supplement and not an alternative to flood-retarding works (40). But the amount of channel improvement installed in watershed projects increased during this period. Moreover, an even larger amount of channel improvement was in the backlog of watershed work plans scheduled to be installed during the 1970's (41).⁷ There was a marked concentration of installed and planned channel works in southern States, mostly in low-lying coastal areas, where the topography made it hard to find economic justification for dams. There was also a small concentration in the Midwest (42).

By the end of 1970, opposition to channel improvements for flood control and drainage had become an environmentalist cause. This controversy was not quite so well publicized but in other respects was quite similar to the older preservationist opposition to big dams, canals, and aqueducts (43).⁸ As in the case of the older cause, effective opposition to channel improvements began with a few cases where proposed projects threatened exceptional resources (44).⁹ But at the end of the decade this opposition was growing in the direction of the virtually blanket opposition to all such works that the older cause had already become (45).

Opponents of channel modification asserted that it destroyed wildlife habitat in streams, on wide strips along their banks, and in rich nearby swamps and wetlands. The last-mentioned effect was said to result from private drainage laterals that were added to the improved channel by adjacent landowners. Opponents contended that, while each individual project might involve only a few miles of modified streambed,¹⁰ the cumulative effect of the program had already resulted in massive losses to wildlife habitat. If unchecked, they maintained, it threatened catastrophic losses, since almost one-fifth of the Nation's farmland was covered by applications for watershed planning assistance (46).

⁷A report on the 558 watershed projects involving channel works that were approved between July 1, 1960, and May 1, 1971, showed that 4,209 miles were completed and 12,426 miles were not completed. Other figures show that applications for an additional 183 containing 6,527 miles of improved channels were pending.

⁸In 1969 and 1970, however, articles exposing SCS "channelization" appeared in the local press and in such national magazines as *Readers Digest* and *Field and Stream*.

⁹These were locally prized resources. SCS's controversial channel works were not at sites as nationally famous as Grand Canyon or the Everglades. But the hardwood wetlands of the Alcovy River in Georgia, for instance, were rich in both scenic and wildlife values and the prairie pothole country near Devil's Lake, North Dakota, was a large and uniquely prolific waterfowl habitat.

¹⁰The average mileage of channel modification works in approved and pending projects containing such works was slightly more than 30 miles per project.

They also alleged that channel modification transformed lovely meandering brooks into bald, straight ditches, hastened the disappearance of southern hardwood forests, and increased streambank erosion and stream sedimentation. They pointed out that channel modification hurried floodwaters out of the watershed instead of holding them there, as land treatment measures and impoundments did. As a consequence, they asserted, channel modification impeded groundwater recharge, caused flooding downstream, and washed silt, fertilizer, and pesticides off the land into rivers and lakes (47).

Opponents of channel modification also complained that SCS was now dominated by the engineering point of view, had too few biologists on its staff, and was too inclined to rely on the limited resources of State fish and game agencies to protect the environment (48). They characterized as unrealistic the policy of relying on voluntary cooperation of sponsoring organizations to accept recommendations for fish and wildlife protection, maintaining that such protection almost invariably lessened the effectiveness and decreased the benefit-cost ratio of the flood control or drainage that was wanted (49). Instead they wanted SCS to insist, as a matter of public interest, that local sponsors accept and pay for wildlife measures as the price of Federal subsidy for flood prevention and drainage (50).

The leading opponents of channel modification were either wildlife professionals or groups representing wildlife or outdoor recreation hobbyists. However, they also raised questions about the economics of the practice and its effect on national agricultural and flood control policy. They asserted that watershed work plans exaggerated the benefits of channel improvements by counting secondary benefits, calculating future benefits at the still unrealistically low Federal water project discount rate,¹¹ and by taking no account of the costs due to loss of scenery and wildlife, lowered groundwater level, and downstream flooding and pollution. They further contended that these benefits accrued only to a few riparian landowners (51).

Opponents also asserted that channel works that were justified for flood prevention or drainage of cropland were in fact used by project sponsors for the improper purpose of draining swamps to bring new land into production. Private owners did this by funding their own drainage outlets into the flood prevention channels financed by the Federal Government. According to some wildlife professionals, this was the "invariable" consequence of channelization in coastal plains (52). In addition, some critics asserted that channel

¹¹As noted in chapters 5 and 6, the discount rate was raised 1½ percent in January 1969, an additional ¼ percent in July 1969, and again in January 1970.

improvements encouraged unwise use of the flood plain and undermined national policy to reduce flood losses by zoning flood plains for uses that could withstand temporary flooding (53).

SCS spokesmen and representatives of project sponsors such as the National Association of Soil and Water Conservation Districts (NACD) replied to those charges. Their replies fell into two categories. One was that the extent of adverse environmental effects from channel modification had been greatly exaggerated by opponents of the practice. The other was that the complaining environmentalists themselves had the ability and the responsibility to prevent such adverse effects by making better use of their opportunities to participate in watershed planning.

The Administrator of SCS pointed out that the purpose of channel improvements was not to drain historic swamps but to improve the carrying capacity of streams that had not overrun their banks until recent times, when they became clogged with sediment as a result of improper cultivation methods and, more recently, suburban building. Consequently, most of the streams that were channelized ran, not through unspoiled forests, but through cropland containing little habitat for wildlife. Some channel modification was adjacent to the paved surfaces of roads, parking lots, and shopping centers (54). Officials of NACD and the Louisiana Soil and Water Conservation District pointed out that channel improvements were needed to protect not only cropland in the low-lying Mississippi Delta, but all land uses, including homes, businesses, highways, railways, airports, recreation areas, and schools (55).

In addition, defenders of channel improvements pointed out that many channel modifications involved only the reworking of old manmade ditches, to remove sediment and brushy growth, and did not include any work in natural streams at all (56).¹² They also argued that most of the streams on which channel works were carried out provided poor fish habitat to begin with because they were intermittent and blocked by obstructions or in some cases flowed only during stormy periods. For these typical streams they maintained that the combination of improved channels and upstream floodwater retarding structures could increase and regularize streamflow and thus actually improve fish habitat (57).

¹²SCS Administrator Grant pointed out as an example of this situation that only 400 of the 3,500 miles of channel improvements that were considered necessary in the White River Basin of Arkansas were on natural streams. He also asserted that there was a significant fishery resource in only 80 of those 400 miles.

Defenders of channel improvement also contended that increased sediment loads in channels due to channel works were a temporary matter, which occurred only during the construction period. Over the long run, they said, the stabilized channels and interrelated land treatment of watershed projects would improve national water quality (58). They also asserted that the alleged adverse effects of channel works on groundwater recharge and downstream flooding had been investigated and found to be minimal (59). Defenders maintained that the recent trend for southern landowners to drain and clear bottomland hardwoods and place the land in highly profitable soybean production was, while regrettable in terms of the loss of timber resource, hardly attributable to SCS channel improvements.¹³

SCS spokesmen did not deny that farmers or others who owned hardwood wetlands adjacent to improved channels would sometimes construct ditches to drain their lands into the channel. But this was considered to be the result of hard-to-resist local tendencies to develop cropland (60). Administrator Grant stated that the more usual effect of P.L. 566 projects was a reduction, rather than an increase, in the total acreage of watershed land allocated to crop production (61).¹⁴

In addition, the Administrator asserted that SCS, working together with fish and wildlife interests and local sponsors, did modify plans to protect significant fish and wildlife or scenic values on streams where such values did exist and would be affected by channel modification. This was done by providing for such "mitigation" methods as (1) clearing debris out of the stream channel without excavating or clearing the edges, (2) clearing the growth of vegetation on one side only, (3) leaving bends or pools in the channel for slower flow, and (4) providing blocks to trap sediment during construction (62).

SCS spokesmen did not deny that there had been cases where channel improvements had resulted in regrettable reduction of wildlife habitat. But they asserted that some of these involved projects approved for operations in the early days of the program, when SCS policies to mitigate wildlife damages and to coordinate its activities with fish and wildlife agencies were not well established (63). SCS spokesmen maintained that other cases where wildlife or scenic values were damaged were mostly instances where the State and Federal fish and wildlife agencies and private conservation organizations (who were primarily

¹³An SCS study of the 17 Arkansas counties on the Mississippi Delta, where 791,000 acres of bottomland hardwoods had been drained and cleared, showed that only 6.8 percent were on P.L. 566 projects (there were 23 such projects in the area).

¹⁴On the basis of data derived from watershed work plans of approved projects concerning planned land use changes.

interested in fish and wildlife preservation) had been unwilling or unable to take advantage of their opportunity to participate in project planning and sponsorship. SCS spokesmen asserted that when such groups had joined with local sponsors and SCS at the beginning of the watershed planning process to formulate a plan that took account of all the water-related needs and opportunities of the watershed, a plan that satisfied all interest groups (or a fair compromise, agreeable to all) generally resulted (64).

This assertion was the heart of the second type of reply that defenders of channel improvements made to the accusation of damage to the environment. Defenders of channel improvements agreed that environmental preservation was in the public interest. But they did not agree that it was more in the public interest than flood control, agricultural water management, or community economic development. Both SCS and soil and water conservation district people tended to resent the criticism of those who insisted that projects that damaged the environment in any way must not be built but who refused to devote any time to solving the flood control and drainage problems of farm people (65).

It is probable that the most significant respect in which the organized environmental movement's protest against channel improvements was different from its protest against other Federal water developments was the later date at which it arose. This protest became a nationally recognized environmentalist "cause" at almost the same time as the passage of the National Environmental Policy Act (NEPA). Federal agencies were required to prepare environmental impact statements for the first time in 1970. SCS's first year statements on channel improvements were criticized as inadequate by the Council on Environmental Quality, which suggested procedures to improve them (66). Nonetheless, at the end of the decade, section 102(1)(c)—with its insistence that all work plans sent for executive branch and congressional review be accompanied by (1) detailed descriptions of environmental impacts in the particular setting, (2) discussion of alternative courses of action, and (3) comments of agencies with jurisdiction and "special expertise"—appeared to be particularly well designed to resolve controversies between environmentalists and SCS over proposed channel improvements.

In addition to making a beginning of the task of integrating the NEPA into its planning and programming activities, SCS took a number of other actions in 1970 to bring its projects, particularly those that included channel improvements, into step with the spirit of the environmental year. It joined with other Federal agencies in formulating model contract provisions

for minimizing air and water pollution (including sedimentation) during any kind of construction. It also began negotiations with State soil and water conservation agencies to set up, as part of the State priority-setting process, an annual state-wide review of environmental aspects of proposed projects (67). It issued one watershed memorandum that reemphasized and tightened agency policies for coordinating planning with Federal and State fish and wildlife agencies and citizens' organizations and strengthened the role of SCS biologists (68). Another memorandum reemphasized and tightened policies for planning and installing "mitigation" measures (69).

In addition, SCS issued a third directive, watershed memorandum 104, that reaffirmed and tightened its policies concerning the necessity for securing informed local approval before proceeding with projects.¹⁵ Watershed memorandum 104 provided that newspaper articles, brochures, or newsletters be used to keep the public informed of planning activities, and that at least two public meetings be held, one when the preliminary investigation report is presented, and another when a work plan has been tentatively agreed on. The purpose of these meetings would be to inform the public and provide it with an opportunity for questions, criticisms, and suggestions. Watershed memorandum 104 specifically provided that information and opportunity to attend the public meetings must be afforded not only to participating and interested local organizations and to landowners on whose property the works were to be installed or who might be assessed to help finance the works but to fish and wildlife and environmentalist groups. Information and opportunity to attend meetings must also be provided to the general public, "particularly those downstream from the project who may believe that the project will affect them...adversely." The memorandum also provided that a summary of all public meetings must be sent with the work plan to the Washington office for review (70).

Public Access to Reservoirs

Another controversy that received increasing public attention in the last 2 years of the decade had been a source of contention between SCS and BSF&W (supported by the State wildlife agencies) since the early 1960's (71). This was the question of public access for recreation to lakes created by watershed project dams.

¹⁵Since the small watershed program was a federally assisted (not a Federal) program, the information program required by watershed memorandum 104 was to be carried out by the local sponsoring organizations with SCS assistance. However, SCS field personnel were instructed to insist that the sponsors faithfully perform this requirement.

Amendments to P.L. 566 in 1958 and 1962 provided that public recreation (within certain well defined limits)¹⁶ and fish and wildlife developments were project purposes to be counted in benefit-cost analysis and were eligible for partial payment by the Federal Government. The Federal cost share was 50 percent of the cost of construction and acquisition of necessary land rights (72). Where recreation or fish and wildlife were project purposes, public access was required. But where impoundments (justified for flood prevention only) provided incidental recreation opportunities, public access was not required (73).

At the end of 1970 the 1,066 small watershed projects that had been approved for construction contained almost 6,000 floodwater impoundments, of which 4,000 were already constructed. There were public recreation developments at only 386 (less than 10 percent) of these small manmade lakes (74). But this figure represented a steady increase in project facilities open to the public. This increase was probably the result of SCS's policy of encouraging multiple-purpose development. Only 6 percent of project plans approved in 1960 had public recreation or wildlife features, whereas 26 percent of the plans approved in 1970 had such features (75). However, critics of the program (including a great many State fish and wildlife officials, who were already angry at the small watershed program because of channel improvements) asserted that most of SCS's floodwater retarding structures were suitable for public recreation. SCS agreed that many of them were (76).

It was SCS policy to encourage local sponsoring agencies and landowners to provide public access to all watershed impoundments that had recreation potential and suitable sanitary facilities. Many of them did (77). But small watershed projects were federally assisted projects—not Federal projects. Where public recreation benefits were not included in a project's economic justification, the decision as to whether or not to allow public access was up to the landowners (who may have only given the local sponsoring organization a flowage easement for the reservoir) or the local sponsoring organization if it had acquired the land (78). This seemed unjust to critics of the program for three reasons:

¹⁶The act limited the number of public recreation developments eligible for Federal assistance to those for which a need was clearly demonstrated; they were not to exceed one development in a watershed of less than 75,000 acres, two in a watershed of less than 150,000 acres, and three in a watershed of more than 150,000 acres. Since it was the policy of the congressional committees responsible for approving projects to insist that flood prevention remain the main purpose of the program, SCS planners were instructed that financial assistance for recreation and fish and wildlife could not exceed 30 percent of the estimated project cost without prior approval of the Administrator.

- (1) Although the Federal Government paid none of the land costs for impoundments that were not justified for recreation or fish and wildlife, it paid most or (in the case of single-purpose structures) all construction costs. Critics considered that the land costs of a landowner who had donated an easement were very modest (79).
- (2) Many of the thousands of small lakes created by the small watershed program and largely paid for by Federal taxpayers were considered to be valuable public recreation resources that were being wasted. This was considered to be inconsistent with Federal policy to cooperate with State and local governments to provide public outdoor recreation resources. State fish and wildlife and parks officials felt particularly strongly about this in areas where other comparable waters for public recreation were lacking or where State agencies did not have adequate funds to acquire reservoir shorelines for recreation purposes (80).
- (3) The Corps of Engineers, Bureau of Reclamation, and TVA provided public access to all their reservoir lakes,¹⁷ which were making a substantial contribution to the fulfillment of national outdoor recreation goals (81).¹⁸

It seemed particularly unjust to such critics that SCS permitted private commercial recreation or fish and wildlife enterprises to be included in watershed projects at some sites where no provision was made for public access (82). Section 108.0441(d) of the Watershed Handbook stated that such private enterprises could be included in watershed projects, provided that the local sponsoring organizations determined "that there is no interest in or need for developing a public enterprise." It also provided that none of the incremental costs that were attributable to the private development were to be borne by the Federal Government.¹⁹

In 1969 and 1970, a controversy arose between an area citizens' group and the sponsoring conservation district concerning one such private commercial enterprise. This controversy became an issue of more than local importance when it attracted the attention of the Conservation and Natural Resources Subcommittees of the House Government Operations Committee. This was the case of dam No. 9 in the Stoney Creek

¹⁷These agencies, unlike SCS, had authority to acquire fee title to reservoir land and shorelines.

¹⁸In 1970, the 568 (generally much larger) reservoir lakes of the three other agencies provided more than 375 million visitor days of outdoor recreation, whereas small watershed lakes provides only 16 million visitor days.

¹⁹As of April 1971, there were 21 cases where additional storage for private recreation purposes was planned or installed in approved or pending watershed projects.

subwatershed of the Potomac River Basin flood prevention project,²⁰ a reservoir lake located entirely on the property of a vacation homesite development company. Dam No. 9 was justified entirely for flood prevention but was planned to include additional recreation storage to be paid for by the landowner, who also agreed to assume the local sponsoring organization's land costs and operation and maintenance responsibilities (83).

Critics of the watershed program's public access policy recommended either that SCS be authorized by act of Congress to acquire fee title to shorelines of impoundments with recreation potential (84) or that section 4(1) of the Watershed Protection and Flood Prevention Act be administratively reinterpreted to mean that local organizations were required, as a condition of receiving Federal assistance, to provide public access to all project impoundments (85).²¹

The reasons SCS and USDA were unwilling to insist that project sponsors provide public access to all watershed structures were not placed fully on the record until after this period was over. At hearings of the House Government Operations Committee's Subcommittee on Conservation and Natural Resources in early 1971, SCS and USDA officials explained that it was the intent of Congress (shown both in the language and in the history of the act and its amendments) to leave the decision of public access and public use of watershed impoundments to the local project sponsors. Furthermore, this intent of Congress had been reinforced by the expressed policy of the congressional committees responsible for both approving projects and amending the program's enabling legislation that flood prevention remain the primary purpose of the program. This being the case, SCS considered it doubtful that the congressional committees responsible for the program would have accepted an administrative decision to condition the granting of local requests for flood prevention assistance on local acceptance of public recreation at the dam sites (86).

In addition, SCS was doubtful of the wisdom of changing its policy. Single-purpose floodwater retarding structures were usually located on privately owned land on which the sponsoring organizations had an easement for the reservoir. Opening such

²⁰A subwatershed of 1 of the 11 larger watershed projects authorized in the Flood Control Act of 1944. These subwatershed projects were governed by essentially the same rules as P.L. 566 projects.

²¹Section 4(1) provided that local organizations were required to acquire "without cost to the Federal Government, such land, easements or rights of way as will be needed in connection with works of improvement installed with Federal assistance." SCS interpreted this provision to mean that where the structure was justified for flood prevention (for which Federal assistance was 100 percent of the construction costs) the local organization was only required to acquire flowage easements for the sediment pool.

structures to public access would mean that the landowner would have to give up additional rights to control use of his own land and that he or the sponsoring organization would incur additional expenses, responsibilities, and liabilities in order to operate, maintain, and police the site for public use (87).

Many single-purpose floodwater reservoirs did not have sufficient recreational value to justify incurring additional expenses and responsibilities (88). In other cases, there was no need for additional public recreation in the community, which might resent an influx of outsiders. In these and other cases, the sponsoring organization might lack the resources and experience necessary for operating sites that were open to the public. This might be a considerable problem in watersheds that had a great many floodwater retarding structures (89).²²

SCS believed that administrative attempts to insist that project sponsors provide public access might be self-defeating. Sponsoring organizations might decide to solve their flooding problems with dry dams, which provide no recreation at all, or to stay out of the watershed program entirely, which would mean forfeiting not only public recreation but all project benefits (90). SCS considered that the only appropriate means to open reservoirs not justified for public recreation to the public was to provide project sponsors with financial help in acquiring the necessary land rights. And that would require an act of Congress (91).

Interagency and Intergovernmental River Basin Planning, 1966-70

Comprehensive river basin planning, involving both the hydrological coordination of upstream and downstream structural developments and the social coordination of the demands of upstream and downstream water users, had long been the accepted ideal of Federal water planners. For this reason, section 6 of the Watershed Protection and Flood Prevention Act authorized USDA to participate in interagency and intergovernmental river basin planning (92). However, until this period, SCS had been given few resources for this activity. As a

²²Proponents of the requirement that sponsors or landowners be required to provide public access to reservoirs built with Federal funds agreed that this should not apply to reservoirs that had no significant recreational values. They were inclined to think, however, that simple provisions of public access would not create other legal responsibilities or liabilities for the provider. They considered that State or local wildlife or parks agencies would generally be willing to assume responsibility for litter pickup and trash collection and that provision of public access might properly be conditioned on the agreement of such State or local agencies to assume such responsibility.

result, SCS had been unable to make enough river basin plans to have much input into watershed project selection.

This situation had already begun to change in the early 1960's when the four departments of the ad hoc Water Resources Council coordinated their river basin planning proposals and budgets. SCS's funding for river basin planning and other interagency coordination activities grew from less than a million dollars in 1962 to almost \$4 million in 1965 (93). But in the second half of the decade, after the passage of the Water Resources Planning Act, the agency's funding for these activities increased to an annual level of about \$8 million (see table 5). This was a very respectable proportion of an average annual appropriation of only \$75 million for the entire watershed program.

Since SCS was the lead agency for USDA river basin planning and participation in the interagency coordination and water resources policy-making activities of the Water Resources Council, it received all of the Department's appropriations for these purposes. But two other USDA agencies, the Economic Research Service (ERS) and the Forest Service (FS), also played important parts in these activities. In the last years of the decade, each of these agencies was allocated over a million dollars a year in SCS transfer funds to perform its responsibilities (94).

ERS responsibilities were to provide: economic base information; projections of agricultural production, employment, income, rural population and land use; economic analysis of agricultural water management needs and potential; and evaluation of the economic impact of water resource development plans on agriculture and related sections of the economy (95).

FS responsibility was to provide information concerning the needs for and effects of water resources development on Federal and non-Federal forested lands and the rangelands in the national forests. In addition, FS was responsible for analyses and projections of economic activity related to forest industries (96).

During the years 1966-70, SCS and other members of the departmental team participated in 12 type I large region framework studies and 15 type II detailed river basin studies coordinated by the Water Resources Council. The type I studies only purported to outline the characteristics of projected water and related land resources problems and general approaches to their solution. But the type II studies also identified numerous potential P.L. 566 projects for initiation in the next 10 to 15 years. These potential upstream projects were coordinated with the mainstream projects of other agencies and were intended to serve downstream as well as upstream flood prevention and other water resources needs (97). The Wabash River basin study

was probably the type II plan in which the Department of Agriculture played the largest part. Although it was not a multiple-objective planning study, the Wabash plan did attempt to give special attention to environmental preservation and regional economic development considerations (98).

Another category of river basin plan that identified future watershed projects was the type IV, or cooperative study. This kind of study was carried out at the request of and under the leadership of State water resources agencies or in some cases, other Federal agencies who were preparing or updating water resources plans. The type IV study to which the Department committed by far the most resources was the Appalachian water resources survey, under the leadership of the Corps of Engineers (99).

During 1966-70, the Department participated in 42 type IV studies; particularly toward the end of the period, these cooperative studies absorbed the largest part of SCS planning funds (100). Beginning in fiscal 1968, State water resources planning activity increased in response to the availability of Federal grants under title III of the Water Resources Planning Act (102). The Type IV studies purported to coordinate upstream and downstream measures for flood control, water supply, recreation, fish, and wildlife and pollution control (101).

Another type of planning that SCS began to participate in at the end of this period was flood hazard analysis. House Document 465 had recommended in 1966 that USDA cooperate with the Corps of Engineers in providing State and local planners with technical assistance and flood hazard data to enable them to prepare flood plain regulations (102). But although SCS requested funding for this purpose for fiscal 1968 (103), it did not at first receive any. SCS began two flood hazard studies in fiscal 1969; its first modest appropriations for flood hazard analysis were for fiscal 1970 (104).

8. THE FEDERAL WATER POLLUTION CONTROL ADMINISTRATION

The Water Quality Act of 1965

The two most important elements of the 1965 amendments to the Federal Water Pollution Control Act (1) did the following:

- (1) Created the Federal Water Pollution Control Administration¹ (FWPCA) in the Department of Health, Education, and Welfare (HEW) and transferred to it most water pollution responsibilities previously held by the Public Health Service (PHS).
- (2) Provided for the establishment and enforcement of water quality standards for U.S. interstate waters.

In addition, these amendments, also known as the Water Quality Act of 1965, made a number of other changes in the program. They extended the Secretary's enforcement powers by enabling him to initiate enforcement conferences on both interstate and navigable waters (without the consent of the Governor of the affected State) if pollution was causing substantial damage to interstate commerce in shellfish. They also created a program of demonstration projects to control discharges of combined storm and sanitary sewers, with appropriations authorized for it at the high rate (for water research and development projects) of \$20 million a year.

The Water Quality Act also increased the authorization of appropriations for 30-percent grants for construction of sewage treatment plants and interceptor sewers—from \$100 million to a

¹The name of this agency was changed from Federal Water Pollution Control Administration (FWPCA) to Federal Water Quality Administration by Section 110, Water Quality Improvement Act of 1970, enacted April 1970. This remained the official name of the agency until December 2, 1970, when all its functions were transferred to the new Environmental Protection Agency (EPA). In this chapter, the agency is uniformly referred to as FWPCA, except when the formation of EPA is discussed.

still very modest \$150 million a year. It also showed some appreciation of the extent to which the construction grant program failed to provide any incentive for treatment plant construction in the large metropolitan areas (which had the largest waste discharges) by raising the ceiling on individual grants to \$1.2 million for single municipal projects (2).² This was also the motive for changing the formula allotting construction grant funds among the States. This formula now provided that only the first \$100 million appropriated would be responsive to allotment preferences for communities with low per capita income and population under 125,000. Whatever additional grant funds were appropriated under this and subsequent authorizations during this period were to be allocated among the States in proportion to their population. The act also provided an incentive of 10 percent additional Federal participation in construction grants for facilities that conformed to a metropolitan area plan.

The 1966 Reorganization

In February 1966, while the transfer of personnel from the Public Health Service to the newly created FWPCA was just getting under way, the President submitted a new reorganization plan to Congress. Reorganization Plan No. 2 of 1966, which went into effect May 2, 1966, transferred FWPCA and most of HEW's pollution control responsibility to the Department of the Interior.

The Johnson administration's reasons for the change have been discussed in more detail in chapter 4. The administration justified the transfer to Interior on the grounds that it would facilitate coordination of the water pollution control effort with other Federal water resources programs. The transfer was also related to the administration's pending clean rivers demonstration proposals for a river basin approach to water pollution abatement (3).

Establishment of Water Quality Standards

Setting standards began immediately after the transfer. It was intended to be a turning point in the development of Federal (and State) water pollution control programs. Spokesmen for both Interior and FWPCA stated that establishment of the

²The previous ceilings had been \$600,000 for individual projects and \$1.2 million for joint municipal projects.

standards was the new agency's most important responsibility and the principal foundation of its future planning, surveillance, construction, and enforcement activities (4).

The act provided that all States must, after public hearings, establish water quality standards for their interstate waters. The standards were required to enhance water quality, protect public health and welfare, and take into account the use of waters for public water supplies, fish and wildlife, recreation, agriculture, and industry. If acceptable to the Secretary of the Interior, these standards would be adopted by the Federal Government. Discharges that violated the standards would be in violation of Federal law. After 180 days' notice to the alleged violator, they would be subject to abatement by direct court action. If any States failed to establish water quality standards for their interstate waters or if their standards were not satisfactory to the Secretary of the Interior by July 1, 1967, he was authorized to initiate proceedings to establish standards himself (5).³

The Water Quality Act required that the standards consist of two elements: (1) water quality criteria, and (2) a plan for the implementation and enforcement of the criteria. Guidelines issued by FWPCA immediately after the transfer to Interior required that the criteria designate future uses (such as recreation, public water supply, fishing, agriculture, or industry) for each stretch of interstate waterway.⁴ The water quality criteria were also required to designate the pollutant limits or limits on effects of pollution needed to provide for such uses (6).

The guidelines also required that the implementation plan include a detailed account of actions that would be taken, including construction schedules, surveillance, monitoring, and enforcement.⁵ Perhaps because the House of Representatives had emphatically rejected the Senate bill's original provision for Federal effluent standards, FWPCA did not prescribe any formula or methodology for translating water quality criteria for receiving waters into specific limits on substances discharged into such waters. Instead, the guidelines stated that there were a number of methods for implementing water quality criteria and that each State could select its own method (7). However,

³These proceedings would include a conference of concerned Federal, State, interstate and local agencies and industries, a 6-month waiting period, and—if requested by the Governor of an affected State—a hearing.

⁴However, no portion of any interstate stream could be classified for the sole or principal purpose of transporting wastes.

⁵Guideline No. 7 provided that implementation plans should include consideration of all relevant sources of pollution and gave, as examples, "municipal and industrial wastes, cooling water discharges, irrigation return flows and combined sewer overflows." The States generally interpreted this to mean that no plans were required for abatement of nonpoint source and agricultural pollution, for which—in any case—little data existed.

the guidelines did stipulate minimum standards for State implementation plans. All discharged wastes "must receive the best practicable treatment or control, unless it can be demonstrated that a lesser degree of treatment or control will provide for water quality enhancement commensurate with proposed present and future water uses." It soon became apparent that FWPCA interpreted this stipulation to mean that implementation plans must provide for secondary sewage treatment or its equivalent for virtually all waste discharges (2).

The process of setting water pollution standards for interstate waters was characterized by cooperation and negotiation between FWPCA and the States. All the States submitted water quality standards before the statutory deadline. But although only a few of the original State standards were completely acceptable to the Department of Interior, the Department did not choose to use its statutory powers to set standards itself. Instead, FWPCA began a process of partial acceptance and bargaining with the States for revisions (9).

The Secretary of Interior abandoned negotiations and resorted to the statutory procedure for setting Federal standards in only one case. After 3 years of unsuccessful negotiations concerning Iowa's refusal to require secondary treatment for all discharges into the Missouri and Mississippi Rivers, the Secretary called a standard-setting conference in 1969. Following this 1969 conference, he promulgated standards requiring "a minimum of secondary treatment to achieve a 90 percent reduction of BOD (biological oxygen demand) prior to discharge" (10).

FWPCA insisted, beginning in the mid-1960's, that secondary sewage treatment was the minimum pollution control measure it would require in all its programs (standards,⁶ construction grants, and enforcement conferences). This policy was opposed by the U.S. Chamber of Commerce as a violation of the intent of Congress that there should be no national effluent standards (11). It was also disputed by the Government Accounting Office and critics of the Federal program on the grounds that (in certain circumstances) a lesser degree of waste treatment was more "efficient" (12). But most States did not resist inclusion of the secondary treatment requirement in their implementation plans, despite the fact that it was a departure from previous State and Federal program requirements. This was probably because secondary treatment had by this time come to be recognized as an economically feasible measure that when properly designed and operated, could reduce BOD in

⁶The agency did accept implementation plans calling for only primary treatment plus disinfection in a few cases of discharges to coastal waters.

organic wastes as much as 90 percent. Secondary treatment was much less costly than the advanced treatment measures that FWPCA and State officials believed were needed to prevent pollution from continuing to increase in growing metropolitan areas and to prevent irreversible damages in vulnerable lakes and estuarial waters (13). By the late 1960's, primary sewage treatment alone had come to seem indecent.

More widespread State opposition was generated by FWPCA's insistence that all standards include the so-called "antidegradation" provision. This controversy began in the summer of 1967 when the Department of Interior approved the first set of water quality standards for 10 States. The initial approvals permitted some highly pure waters to receive more pollutants than they had been receiving. However, they required that the resulting additional pollution not cause the receiving waters to fall below the criteria established for the highest use of the waters. The National Wildlife Federation, other conservation groups, and influential members of Congress asserted that these approvals violated FWPCA's own guideline No. 1, which stated that no State standard providing for less than existing water quality was acceptable. This issue pitted the organized conservation movement against State officials and industries and split the ranks of the Department of the Interior. The Assistant Secretary for Water Pollution Control supported the position of the conservation organizations and the Commissioner of FWPCA opposed it (14).

On February 8, 1968, Secretary Udall tightened Federal requirements. He announced that henceforth all State standards would have to contain an antidegradation provision. Such a provision must state that waters whose existing quality was better than the established standards would not be lowered in quality, unless it was affirmatively demonstrated to both the State and Federal water pollution control agencies that such a change (1) was justified by necessary economic or social development, and (2) would not interfere with any of the uses assigned to the waters. States whose standards had already been approved without such an antidegradation provision were asked to revise them to conform with the new policy (15).

Udall's new requirement was bitterly criticized by the Western Governors' Conference, the Southern Governors' Conference, the Association of Attorneys General, and the U.S. Chamber of Commerce. The essence of their argument was that the antidegradation provision would infringe State government powers by giving the Secretary of the Interior what amounted to a veto power over new industrial development (16). Although FWPCA continued to insist that States adopt some antidegradation policy, this was resisted by many States. Many

formulations of the policy were developed (and in some cases accepted) that were intended both to satisfy the Secretary of Interior and allow new discharges. The unwillingness of individual States to adopt antidegradation provisions was still being negotiated at the end of 1970. But FWPCA, in practice, was much less adamant in its insistence on nondegradation than it was on secondary treatment. No showing was required for any Federal grant or enforcement purpose that a State had adopted or was implementing an antidegradation rule (17).

By the end of this period, the Federal agency had substantially completed its mission of making sure that States established receiving water quality standards for interstate waters. Indeed, Federal officials considered that they were largely responsible for the creation, during 1966-70, of a nationwide system of basic stream standards. This was because the great majority of the States adopted standards for their intrastate streams at this time. The intrastate standards contained the same criteria for various uses as the interstate standards and the same requirement of secondary treatment for all sizeable discharges of organic wastes (18).

The Federal agency had "fully approved" the interstate standards of only 29 States by the end of 1970. The rest had been approved with exceptions and were expected to be successfully negotiated. Federal water quality officials considered that these exceptions were not of major importance. The exceptions mainly concerned temperature and dissolved oxygen requirements for fish and wildlife, laxness in abatement schedules, or failure to include an antidegradation statement (19).

Agency Dissatisfactions with the Water Quality Standards

By the end of the decade, Federal water quality officials had come to the conclusion that there were other serious deficiencies in the water quality standards system. These alleged deficiencies would have to be corrected to implement the water quality criteria and enhance water quality. Some of these were the result of compromises that had been made to secure the passage of the Water Quality Act in the face of State government and industry objections (20). The opposition generated by the antidegradation rule and the secondary treatment requirement indicated that such objections still had considerable support. But they were no match for the massive public support behind the "clean water movement" of 1969 and 1970. In this climate of opinion, Federal water quality officials found Secretary of Interior Hickel and President Nixon responsive to their

proposals for reform. Several of these were included in the President's February 1970 proposals for amendment of the Water Pollution Control Act (21).

The aspects of the water quality standards systems that the Federal agency wanted to change can be grouped into three categories: (1) Federal enforcement authority, (2) inadequacy of State water quality criteria, and (3) nature and scope of State implementation plans.

Difficulties enforcing the standards were considered the most troublesome. There had been a belief that enforcing the abatement of standards violations would be a less costly and time-consuming Federal enforcement tool than the Federal-State enforcement conference. It was expected that this tool could be used to abate polluting discharges before they developed into major pollution controversies. This had been the principal reason why water quality standards had been wanted in the first place (22). But the legislative compromises that had been made to avoid undercutting State authority made it very difficult for the Federal Government to enforce the standards.

The statutory provision for enforcement of the water quality standards looked as if it provided a quicker procedure than the general abatement or conference provision. Under that older procedure, the Secretary was required to call a conference at which FWPCA negotiated with State agencies to help the States abate municipal or industrial pollution. The Attorney General could seek a court injunction directly against the polluter or polluters only after failure to get results from an enforcement conference followed by a hearing and two 6-month waiting periods.⁷ In contrast, the standards provision stated that, once interstate water quality standards were violated, the Federal Government might proceed to court after giving the alleged polluter only 6 months' notice (23).

Although the Senate bill had provided Federal standards for all navigable waters, the Water Quality Act, as passed, provided them only for interstate and coastal waters. This, by itself, was probably not the source of what the Federal agency considered its most significant enforcement problems.

The standards procedure was subject to the same jurisdictional test of interstate "danger to health and welfare," under section 10(g) of the Water Pollution Control Act, that had proved to be so burdensome in the general abatement procedure. This meant that the Secretary could not bring an enforcement action under the standards provision on the mere showing that: (1) the discharger

⁷In practice, the Federal Government had only brought four general abatement actions to the hearings stage and one to the court action stage (with somewhat disappointing results). Other conferences were reconvened for additional negotiations when expected results were not achieved. (See appendix.)

being sued was responsible for the violation of receiving water criteria (a difficult enough thing to prove on the basis of sampling the receiving waters), and (2) he was not complying with the State's implementation plan. In addition, the particular discharge had to be traced across State borders and shown to be endangering the health and welfare of persons in a State other than the State in which the discharge originated, just as in the conference procedure. This meant that the Federal Government would have a greater burden of proof (and FWPCA would have to do more costly and time consuming investigative work) if it proceeded under the standards provision than if it proceeded under the admittedly slow and cumbersome conference procedure (24).

In addition, section 10(g) provided that when a discharge violating Federal water quality standards caused harm only in the State in which it originated, the Secretary had to obtain the consent of the State Governor before the Federal Government could act on the violation (25). This was the case of discharges that violated water quality standards in many coastal areas. Thus, for a large proportion of the waters for which Federal standards existed, the primary responsibility for enforcing the standards remained with the States, where primary responsibility for pollution abatement had been before the adoption of Federal standards.

Most of all, Federal officials regretted that the statute made no provision for effluent standards. If Federal water quality criteria included criteria for the quantity and quality of effluents and if implementation plans provided for the abatement of components of effluents, the task of enforcing standards would be greatly simplified. Federal officials believed that it would be easier to prove that discharges did not meet effluent standards than it would be to prove that they caused the receiving waters to fall below water quality standards. The officials believed this would clarify their authority to abate individual discharges in heavily polluted areas where pollution is caused by a multiplicity of discharges, and would eliminate the much abused mixing zone concept (26).⁸

Another source of dissatisfaction with the standards concerned water quality criteria. In early 1967, the Secretary of Interior appointed a national technical advisory committee and authorized it to review all available scientific findings and develop criteria for the five general areas of water use identified in the statute. These criteria were used by the Secretary for his review of State standards and were also made available to the

⁸Water quality standards implementation plans permitted each discharger a "mixing zone" or stretch of river adjacent to its waste outfall, in which it would be allowed to mix its wastes and in which water quality measurements would not be made.

States (27). As incorporated into FWPCA guidelines, these criteria attempted to specify limits for 10 water quality parameters for 9 major water uses (28).⁹

But, by the end of the decade, Federal officials believed that these criteria needed considerable refinement to protect the intended water uses and that more scientific knowledge was needed to determine what quantities of various pollutants were harmful. The agency was well aware that there were no criteria for the phosphates and nitrates (that its own scientists were now identifying as the principal causes of lake eutrophication) or the pesticides and mercury involved in current threats to wildlife and public health (29). FWPCA was also aware that there were many cases where water quality criteria could not be achieved so long as implementation plans failed to provide abatement requirements for other than municipal and industrial point sources (30).

Two efforts to improve water quality criteria that began before this period was over concerned radioactivity and pesticides. FWPCA began cooperative studies with the Atomic Energy Commission and the PHS to develop improved radiological criteria that would provide the increased protection required by the expected growth of the nuclear power industry (31). In the case of pesticides, section 105(L)(1) of the Water Quality Improvement Act, passed in April 1970, instructed the Federal agency to develop specific and quantified information on pesticides for subsequent incorporation into water quality standards (32).

Federal water quality officials also urged adoption of effluent standards for reasons other than enforcement. They believed that design of abatement systems required knowledge and use of specific limits on the type, volume, and concentration of waste discharges that lowered water quality. They considered this was particularly necessary to control industrial waste discharges containing pollutants (such as synthetic chemicals, metals, minerals, and heat) not susceptible to secondary treatment. They also believed that effluent standards would be necessary to relate the volume of discharge to the need for more than secondary sewage treatment in some metropolitan areas (33).

The Clean Water Restoration Act of 1966

After the passage of the Water Quality Act and transfer of FWPCA to the Interior Department, the Johnson administration

⁹The parameters were: pH, temperature, dissolved oxygen, bacteria, radioactivity, turbidity, color, taste and odor, solids, and toxic substances.

and the Senate Subcommittee on Air and Water Pollution were in agreement that the Federal water pollution control program required further augmentation (34). But they disagreed (see chapter 4) on the shape this program augmentation ought to take. The administration approach would have reoriented the Federal program toward a regional basis but would not have increased the national construction grant program (35).¹⁰ The Clean Water Restoration Act (36) mainly incorporated Senator Muskie's viewpoint. This was that an adequate planning base for a nationwide treatment plant construction program to supply a "backlog of unmet needs" could be provided by the new water quality standards and newly aggressive State water pollution control programs. What the subcommittee now saw as chiefly needed was a continuation of Federal (and State) investment in treatment plant construction and research at a level proportionate to the national importance of the water pollution problem (37).

The Water Quality Act had raised the construction grant authorization to \$150 million a year. The 1966 Act authorized \$3.4 billion for a 4-year period, to be distributed as follows: \$450 million in fiscal 1968, \$700 million in fiscal 1969, \$1 billion in fiscal 1970, and \$1.25 billion in fiscal 1971 (38).

In addition, the 1966 act attempted to eliminate the construction grant program's previous bias against large metropolitan areas and to encourage construction of larger sewage treatment facilities that provided economies of scale. It did this by removing the dollar ceilings on individual projects. As an incentive to State participation, the act provided that the Federal share of the construction cost would be increased from 30 to 40 percent if the State agreed to pay 30 percent of the cost. The Federal share of the construction cost would be increased to 50 percent if the State agreed both to pay at least 25 percent of the cost and to set enforceable water quality standards for the waters into which the project discharged. If, in addition, the project conformed to a comprehensive metropolitan plan, the Federal share would rise to a maximum of 55 percent (39). The act sought to encourage States (such as New York, which had raised its own sewage plant construction funds) to proceed with their own construction programs. For this reason, it provided that reimbursement could be made to State or local agencies

¹⁰The administration bill had provided for regional agencies to be established in demonstration river basins. The regional agencies were to be required to draw up comprehensive pollution control plans, enforce abatement, construct treatment plants and water and sewer facilities, and raise revenues. The Federal Government would then contribute 30 percent of the cost of planned treatment plants with the proviso that the regional agencies would arrange for subsequent treatment facility construction to be locally financed. The initial appropriation for this program was to be \$50 million in 1968.

that began construction of approved projects with less than the approved or no Federal aid. But approval of a project by the Secretary of Interior was not to be construed as a commitment by the government to pay for any part of the project if funds were not available (40).

The 1966 act also greatly increased FWPCA's research program. Between 1961 and 1965, the PHS research program under the Federal Water Pollution Control Act had operated under an authorization ceiling of \$10 million a year. This program mainly consisted of in-house and extramural studies to discover: (1) new information and technology concerning advanced municipal waste treatment; (2) means to identify and measure pollutants; (3) stream flow augmentation to dilute pollution; and (4) the entire range of pollution control problems relating to the Great Lakes (41). Of the \$10 million a year, \$5 million was for Great Lakes research (42). The 1965 Water Quality Act added to this program a new program of research and development grants to State, local, and regional agencies for projects to demonstrate new and improved methods for controlling pollution from storm sewers or combined storm and sanitary sewers (43). The 1966 act removed appropriation ceilings on the agency's old research program (44).

In addition, the 1966 act incorporated the combined sewer program into a larger program of extramural demonstration projects. This larger program also included demonstration of new and improved methods of advanced waste treatment, joint municipal-industrial waste treatment, and industrial water pollution control. Grants for demonstration of industrial pollution control could be awarded to private sector recipients, but were required to be of industry-wide application. The others could be awarded only to public agencies.

The act authorized \$200 million for these demonstration project grants over a period of 4 years.¹¹ Individual grants could amount to as much as \$1 million. For demonstrations of combined sewer pollution control, advanced waste treatment, and joint municipal-industrial waste treatment, Federal participation could be as much as 75 percent of the estimated cost of the project. For demonstrations of industrial water pollution control, it could be as much as 70 percent (45).

In addition, the act authorized \$3 million for an FWPCA-led interagency, intergovernmental study of the effects of pollution (including sedimentation) on estuarine zones (46).

The Clean Water Restoration Act also raised the authorization for grants to State and interstate agencies for water pollution control programs from \$5 to \$10 million a year. It added

¹¹Of this, \$20 million was authorized to be appropriated by the end of fiscal 1966 and \$60 million annually in fiscal years 1967 through 1969.

training of personnel to the purposes for which these grants could be spent (47). Moreover, it provided for additional grants—of as much as 50 percent of the administrative expenses of State and interstate planning agencies for 3 years—to develop comprehensive river pollution control plans for entire river basins, including estuaries (48).

The 1966 amendments also made two changes affecting the enforcement conference procedure: one applied this procedure to international boundary waters (49); and the other provided that (with the consent of a majority of the conferees) the Secretary could require individual dischargers to disclose their records on the character and quantity of their effluents and on whatever pollution control methods they were using. Industrial firms could not be required to reveal trade secrets or secret processes (50).

In addition, section 211 of the Clean Water Restoration Act revised the Oil Pollution Control Act of 1924 by extending its geographical coverage to include inland navigable waters, as well as estuarial and coastal waters,¹² and transferred responsibility for its administration from the Corps of Engineers to FWPCA. Section 211 prohibited oil discharges from vessels (except as permitted by regulations of the Secretary of Interior) and established criminal prosecution and liability for cleanup (51).

Another component of the Clean Water Restoration Act that was important for the future of the Federal program was section 210. This innovative section authorized the Secretary of Interior to make a number of studies and reports to Congress as a basis for evaluating existing water pollution control programs and developing new ones. The most important of these studies was the one that came to be known as “the cost of clean water.” This study was directed to include: (1) a detailed study of the estimated cost of carrying out the Federal Water Pollution Control Act; (2) a comprehensive estimate of the economic impact on affected units of government of installing treatment facilities; and (3) a comprehensive analysis of the national need for and cost of treating municipal, industrial, and other wastes to attain State and Federal water quality standards. Items (1) and (2) were to be reported for the 5-year period beginning July 1, 1968, and updated each year thereafter.

Another economic study (directed by section 210 to be reported by January 1968) concerned the effectiveness of various incentives to

¹²Another, little-noticed revision of the Oil Pollution Act was made by the House-Senate conference committee immediately before passage of the 1966 Act. The conference report changed the definition of the term “discharge” to apply only to “grossly negligent or willful” discharges. This was soon discovered to have significantly reduced the capability of the Act to control oil pollution (as previously noted in chapter 5), and was the principal reason why the Corps of Engineers began to prosecute oil dischargers under the Refuse Act of 1899.

industries to reduce or abate their polluting discharges. Two other studies, for which reports by July 1, 1967 were required, concerned: (1) the need for additional trained State and local water pollution control personnel and the availability of Federal programs to train such personnel; and (2) the extent of the pollution of navigable waters by litter and sewage from watercraft and methods of reducing or abating such pollution (52).

Appropriations for Construction Grants, Research, and Development

In the fall of 1969, the organized environmental movement insisted that Congress must appropriate a sum that was at least close to the amount it had authorized for construction grants.¹³ Until then, there was not even the beginning of an attempt to carry out the principal objective of the Clean Water Restoration Act. This was to respond to the strong national interest in water pollution control and the apparent inadequacy of locally funded waste treatment facility construction programs by bringing significant sums of Federal money to bear on the problem (53). This was the traditional way the government had previously responded to national interest in other formerly local responsibilities such as flood control, aid to the indigent, highway construction, and many others.

However, the Clean Water Act, like virtually all the other water resources programs discussed in this history, was affected by domestic program budget restrictions during the Vietnam war. The act authorized substantial sums for waste treatment construction grants; actual appropriation requests were much lower: \$450 million was authorized for fiscal 1968 construction grants, but only \$203 million was actually appropriated. As a result of a joint resolution and anti-inflationary legislation, not all of this was actually spent. For fiscal 1969, \$700 million was authorized, but only \$214 million—less than a third of the authorization—was actually appropriated. For fiscal 1970, the authorization was \$1 billion, but only \$214 million was requested—less than a quarter of the authorization. The \$800-million appropriation enacted was the product of public interest group lobbying and publicity at the high point of the environmental movement. Even the fiscal 1971 appropriation, which was proposed as part of President Nixon's environmental program, was still \$250 million short of the \$1.25 billion authorized in the 1966 act (54).

Although the 4 years' appropriations under the Clean Water Act were about half of the authorization, they did provide more Federal grant money for waste treatment facility construction

¹³This episode is described in chapter 4.

than had previously been available. But critics of the program contended at the end of the period that the effect of underfunding appropriations had been to delay, rather than to hasten, the construction of waste treatment facilities that would have occurred without any Federal funding (55). This assertion is open to dispute, but underfunding the Federal grant program unquestionably delayed construction programs begun in anticipation of Federal funds.

Before 1967, when there was a \$1.2-million ceiling on the amount of any single municipal project, the Government paid only 30 percent of construction costs. The modest appropriations for construction grants had provided a real spur to construction of small waste treatment plants. But these small grants did not provide any incentive for large municipal projects or facilities capable of treating substantial quantities of industrial wastes (56).

Removal of dollar ceilings and increasing the maximum Federal contribution to 55 percent provided an incentive for construction of multi-million-dollar treatment plants. It also provided an incentive to heavily polluted metropolitan areas to seek Federal grants. Such metropolitan areas needed to build new treatment facilities to conform with local political pressures, orders of enforcement conferences, or implementation plans of State water quality standards. However, since the sums dispensed were so much less than sums authorized, municipalities not receiving Federal and/or State funding decided to delay their construction programs and wait until Federal funds were available (57). A GAO report to Congress in late 1969 showed that State officials were distressed that so many projects they had applied for were not funded in fiscal 1968 and 1969. These officials believed that the construction required in water quality implementation plans would not proceed without Federal grant money, and that unless more money was made available, planned time schedules could not be met (58).

Other aspects of the water pollution control program for which authorizations were increased by the 1966 act were also not funded at the authorized level. The act had authorized \$60 million a year for the new demonstration project program of extramural research for fiscal years 1967-69 (59). This same authorization was extended by the Water Quality Improvement Act of 1970 to fiscal 1970 and 1971 (60). But in actuality, the demonstration project grant program was only funded at about \$20 million annually during fiscal years 1966-69, and at a lesser rate in 1970 and 1971. Still, the Clean Water Act greatly increased FWPCA's overall research and development program, which rose from \$11 million in fiscal 1965 to \$44 million in fiscal 1969 (61).

FWPCA Programs in Research, Demonstration, and Training

FWPCA's appropriations for research, which were mainly under sections 5 and 6 of the Federal Water Pollution Control Act, increased fivefold between fiscal 1965 and 1971. Extramural programs became predominant (62). In the early 1960's, most of the PHS's water pollution control research had been performed at the agency's Cincinnati, Ohio, laboratory or through small grants to educational institutions. But a network of seven new regional laboratories that had been authorized in 1961 became operational around 1965. These regional laboratories were intended to produce centers of expertise to conduct in-house research as the foundation for a well-coordinated series of extramural projects. However, governmental limitations on personnel, which began in fiscal 1968 and continued to the end of the period, resulted in less in-house research than was originally planned. Instead, laboratory personnel were mainly used to supervise extramural research projects (63).

Section 5(a) of the Federal Water Pollution Control Act¹⁴ authorized the Secretary of Interior to conduct, encourage, and coordinate research, development, demonstration, and training relating to causes, control, and prevention of water pollution. Section 5(a) also authorized the Secretary to make use of grants to and contracts with public and private agencies and individuals. But substantial portions of this activity were funded under specific programs added separately by the amendments of 1961, 1965, and 1966, which have already been discussed, and by the Water Quality Improvement Act of 1970. Many of these programs had their own rules concerning type and method of study, eligibility of outside agencies for funding, and percent of Federal contribution. Some were mandatory, some were authorized together with their own separate appropriations, and some were authorized to be funded by FWPCA's general research and development appropriations.

For example, in the period between the enactments of the amendments of 1966 and 1970, the act required FWPCA to finance pilot programs to train waste water treatment plant operators (64), and to conduct and supervise studies concerning the special problems of the Great Lakes (65) and estuarine zones (66). The 1970 amendments added to these mandatory studies new ones concerning control of sewage from vessels (67), and pollution from oil (68) and pesticides (69). The authorized

¹⁴That is, the Federal Water Pollution Control Act of 1948 as amended in 1956, 1961, 1965, 1966, and 1970. The 1972 amendments occurred after the period covered by this history and are not referred to when the act is discussed, either here or elsewhere in this chapter.

(rather than mandatory) programs included, in addition to the four demonstration project programs of the 1966 Act (70), new demonstration project programs added by the 1970 Act: acid mine drainage (71), pollution control in the Great Lakes (72), lake eutrophication control (73), and water quality problems of native villages in Alaska (74). The 1970 act also authorized grants or contracts facilitating college programs for training water pollution control personnel and scholarships for the trainees (75).

The agency's effort to integrate its research program is shown in its June 1970 status report (76). In this report FWPCA described its current research program as being divided for administrative purposes into five major single source categories and three multiple source categories. The categories of single source pollution were: (1) municipal (which included problems concerning combined sewers, joint industrial-municipal treatment systems, and urban sedimentation); (2) industrial; (3) agricultural; (4) mining; and (5) pollution from other sources (especially vessels and oil pollution). The three multiple source research categories were: (1) water quality control technology (which involved eutrophication, thermal pollution, and industrial process changes to eliminate wastes); (2) waste treatment and ultimate disposal (which included advanced treatment and recycling of wastewaters); and (3) water quality requirements (which involved methods to determine sound water quality criteria for synthetic chemicals, heat, and industrial wastes).

FWPCA's research program was an applied research program intended to supply information and technology needed by the other units of the agency for performance of their missions (77).¹⁵ However, several reports on the research program, made shortly after this period was over, questioned the extent to which it was achieving this aim.

The GAO's report on FWPCA research (78) asserted that many grants for demonstrations of industrial pollution control had been awarded for construction and operation of full-scale treatment plants to demonstrate conventional technology already in widespread use. (FWPCA officials agreed with this finding but explained that these projects applied conventional technology to types of wastes that had not previously been treated by such technology.)

The Ralph Nader study group on water pollution asserted—without much fear of contravention—that most of the agency's

¹⁵FWPCA also sponsored a small amount of basic water quality research. Larger programs in this area were supported by the National Science Foundation, HEW's National Institute of Environmental Health, and Interior's Office of Water Resources Research.

advanced waste treatment and phosphate removal projects had also failed to demonstrate “new and improved methods” (79). Furthermore, the Nader group reported these processes—new or not—were not being adopted to any significant degree by municipal waste treatment plants (80). But the Nader group acknowledged that the agency’s work in physical-chemical treatment was an important innovation and was being applied (81), and that the agency’s work in large-scale land application of treated effluent was perhaps the ultimate solution to water pollution problems (82).

The Nader group also contended that a large proportion of the demonstration grant money given to industry was an unjustified and counterproductive subsidy. They believed that industrial firms were using their applications for demonstration grant money as a pretext for failing to comply with water quality law. They argued that if State and Federal laws were strictly enforced, industry would realize that it was required to pay for whatever methods were necessary for compliance and would be motivated to seek the most efficient method (83).

Defenders of industrial project grants conceded these grants were neither an efficient nor a completely equitable method of spurring industrial pollution control.¹⁶ But they also believed that the carrot of demonstration grant money plus the stick of enforcement were more effective than enforcement alone. These defenders did not think it would be politically feasible to use enforcement alone to compel industries to perform their own research, in cases where industries claimed that economically feasible treatment processes were not available. They believed that (except where public health was endangered—as in the mercury situation) the public was not ready to support the factory shutdowns and loss of jobs that would result from such a policy (84).

Planning

FWPCA’s planning program was conducted under section 3 of the Federal Water Pollution Control Act (85). It consisted of two main parts: (1) a variety of types of in-house planning, under section 3(a) of the act; and (2) the Federal grant-assisted State and local river basin planning, under section 3(c), that had been authorized by the Clean Water Act of 1966. The

¹⁶It was agency policy to attempt to reduce inequity and increase program effectiveness by distributing grants among a variety of industries with difficult waste disposal problems. In addition, the law provided that all demonstrations of industrial pollution control must be of industry-wide application.

agency also conducted investigations of the need for water quality storage in connection with plans for Corps and Bureau of Reclamation reservoirs under section 3(b).

Authority for Federal pollution control planning for interstate waters, under section 3(a), antedated both the Water Resources Planning Act of 1965 and the recommendations of the Senate Select Committee on National Water Resources in 1961. Section 3(a) also authorized joint investigations with State and interstate agencies of any waters. But the PHS planning program did not get underway until the early 1960's. At that time, the agency divided the nation into 20 major drainage areas consisting of approximately 210 river basins and made plans to begin comprehensive water quality management studies in all of them. This program was continued by FWPCA; by 1968, comprehensive study projects were underway in 15 of the major drainage basins (86).

The comprehensive studies consisted mainly of extensive surveys of the sources and effects of pollution. They were expected to provide data for use of State water quality planners, incorporation into the WRC multiple-purpose planning studies, and support for Federal enforcement actions. They were also used for development of water quality standards by the States and for review of such standards by FWPCA (87).

Beginning in 1967, comprehensive study projects, regional offices where comprehensive studies were not in progress, and FWPCA headquarters were all directed to place more emphasis on developing guides for pollution control action planning by State and local agencies (88). Moreover, in the last years of the decade the agency also played an increasing role in interagency water resources and environmental planning efforts (89).

FWPCA's in-house planning included participation in all the WRC-sponsored type I and type II multiple-purpose studies. Much of FWPCA's contribution to those studies consisted of data that had previously been gathered by comprehensive study projects (90). The primary purpose of FWPCA participation was to ensure that water quality considerations would be taken into account in future construction and management of Federal and federally-assisted reservoir and channel improvements (91). But some of these studies also produced data that could be used as the basis for future planning of treatment plant construction programs. For instance, the Susquehanna basin type II study identified all the major pollution sources in the basin and their effects on water quality standards, as well as the pollution control needs of the various communities in the basin. It did not, however, make specific recommendations concerning the number, location, or design capability of the treatment facilities needed to attain water quality standards. Nor did it recommend

changes in local governmental institutions necessary to finance, construct, and operate such facilities (92).

Other multiple-purpose planning efforts in which FWPCA participated included the Appalachian water resources survey and the national wild and scenic rivers studies. FWPCA also participated in a number of in-depth studies and analyses of water quality effects of proposed Federal agency water resources developments (such as the Texas water import plan and the San Joaquin master drain in the Central Valley of California). In addition, the FWPCA planning staff reviewed all project reports of the Corps, Bureau of Reclamation, and SCS, and all applications for FPC and Atomic Energy Commission license (93). The agency also participated in a number of interagency environmental investigations of nonfederal developments. These included studying the effect of a proposed jetport on the Everglades and a comprehensive survey of considerations affecting powerplant siting, led by the Office of Science and Technology (94).

But FWPCA's planning program was primarily based on single-purpose water quality management studies, which the agency undertook both alone and in collaboration with State and interstate organizations. An example was participation with the Delaware River Basin Commission in the development of a plan and program for upgrading the highly polluted Delaware estuary. This enterprise involved FWPCA's pioneering development of systems analysis techniques to model the Delaware and test the cost effectiveness of alternative approaches to water quality improvements (95).

In the last years of the period, much of FWPCA's planning effort was concentrated on development of highly sophisticated systems analysis techniques. FWPCA developed and applied these models to a number of river basins to show the relationship between stream flows, water uses, waste loadings at various outfalls, tidal action, and other factors. At the end of the period, the agency was applying its most advanced model of estuarial water quality to the upper Potomac estuary, near Washington, to aid the work of the Potomac River enforcement conference (96).

In addition, the agency continued and came near to concluding the comprehensive study projects begun in the early 1960's. Nine of these studies were completed by the end of 1970. They were the basin studies of Lake Ontario, Lake Erie, Lake Huron, Lake Michigan, Lake Superior, and the Snake, Susquehanna, Willamette, and Patuxent Rivers. The remaining studies were scheduled for completion in 1971. These comprehensive study project reports included discrete detailed solutions for a few subareas but mainly provided framework plans that would have

to be translated into detailed action plans before they could be put to use (97).

However, there was one program of water quality planning to provide detailed action plans under the Federal Water Pollution Control Act. This was the program of grants of up to 50 percent of administrative expenses to State, local, and interstate planning agencies for river basin planning. Section 3(c) provided grants to help planning agencies develop plans that made specific recommendations for treatment works and sewer systems, including means to encourage both municipal and industrial use of such works and systems. It also provided that plans must recommend methods for adequately financing the facilities necessary for implementation (98).¹⁷

Guidelines for applications for section 3(c) grants, which FWPCA sent to all State, local, and interstate pollution control agencies, explained that the plans must also recommend permanent basinwide water quality management programs, involving joint efforts of the State and local governments. In addition, guidelines provided that the plans must include recommendations for an institutional framework through which various governments of the basin could coordinate their pollution control efforts on a continuing basis (99).

This program, authorized in 1966, was begun in fiscal 1968 with an appropriation of \$500,000, which was raised to \$1.25 million in fiscal 1969 and \$2.4 million in fiscal 1970. The fiscal 1970 appropriation was a substantial sum in the context of FWPCA spending on river basin planning. It represented a recognition of the greatly increased emphasis that the agency placed on preparation of river basin level waste collection and treatment facility plans. This emphasis resulted from the findings of the GAO studies on the effectiveness of the construction grant program discussed below (100). By the end of 1970, river basin planning grants had been made to 23 agencies in 17 States. The average grant support for individual planning projects was slightly more than \$100,000 a year, over a 2-year period.

The Relationship of Planning and the Construction Grant Program

The Federal Water Pollution Control Act amendments of 1956, which created the construction grant program, provided that grants should only be given to aid construction of projects

¹⁷Section 3(c) also provided that river basin plans must be consistent with and provide for maintenance of the applicable Federal or State water quality standards.

that were included in Federal "comprehensive programs" and in federally approved State water pollution control programs.¹⁸ In addition, the act required the States to certify that all projects receiving grants were entitled to priority over other eligible projects on the basis of financial and water pollution needs (101).

However, a 1969 GAO study revealed that FWPCA's administration of the statutory provisions for coordination of planning and construction had not been effective and required reform. This finding was substantially accepted by FWPCA.

The GAO report asserted that the construction grant program had been less effective in actually abating pollution than could legitimately be expected of the Federal investment of \$1.2 billion for the construction of more than 9,400 projects with a total estimated cost of \$5.4 billion. The report stated that the reason for this disappointing result was inadequacy of planning. Construction grants had been awarded on a "first come, first served" or readiness to proceed basis. Selections had not been made on the basis of Federal or State plans that indicated which new municipal treatment plants would do the most good. As a result, many facilities had been built with Federal aid on waterways where their effects were negligible, because major industrial and municipal polluters continued to discharge untreated or inadequately treated wastes into the same waterways (102).

GAO's review of construction grant administrative procedures found that, until 1968, FWPCA had complied with the act's requirement that grants only be given to projects included in Federal comprehensive programs "largely by resorting to fiction." This was done because the construction grant program got underway before the agency's river basin studies program. Consequently, the "comprehensive programs" used by FWPCA for awarding construction grants were little more than State lists of all municipalities in each State that needed new waste treatment facilities or might need them in the foreseeable future (103).

However, in 1967 (when the Nation seemed to be beginning a great expansion in federally assisted waste treatment facility construction) FWPCA officials decided it was necessary to make the comprehensive programs requirement more meaningful (104). In January 1968, the agency published new guidelines stating that a project eligible for grant must be included in or compatible with the comprehensive plan being developed under section 3(a) of the act, if there was such a plan for the area of

¹⁸Section 7, which authorized grants to State and interstate water pollution control programs, required that after 1966 each such program be based on a plan approved by the Secretary of Interior.

the project. If there was no Federal plan and none was being developed, a project would still be eligible if included in or compatible with applicable Federal water quality standards, the State's water pollution control plan, or the recommendations of an enforcement conference (105).

But GAO stated that because of the inadequacy of Federal planning and State assignment of project priority, this change in the guidelines made little difference. GAO found that Federal comprehensive plans had not generally provided the kind of information that could be used in selecting among proposed municipal treatment facilities (106). Beginning in 1967, State water pollution control plans had been much improved by incorporation of water quality standards implementation schedules. But the GAO report pointed out that these implementation schedules provided for construction of all needed municipal facilities within 5 years, and did not identify the facilities most urgently needed, if all could not be built in this time period (107).

GAO also pointed out that municipalities were not building treatment plants according to schedules set forth in State water quality standard implementation plans, but instead were waiting until Federal grant money authorized by the Clean Water Restoration Act became available (108). Because it was likely that much less Federal funding would be available than was needed to subsidize all projects in State implementation plans, the report asserted that it was essential that State priority listings pinpoint the projects that would accomplish the most actual pollution abatement. Instead, GAO found that the States assigned project priority on the basis of the two requirements of the statute—water pollution need and financial need—plus the readiness and willingness of individual local governments to proceed. Since some degree of water pollution and financial need was ubiquitous, and since municipalities with the greatest financial need often did not submit applications, readiness to proceed was usually the determining factor (109).

The GAO's basic recommendation was that henceforth FWPCA should award construction grants and that States should select projects for priority on the basis of two factors: (1) the actual pollution abatement such projects would be able to achieve; and (2) the coordinated actions taken or planned by other polluters of the same waterways (110). To achieve this result, GAO recommended that FWPCA increase its use of systems analysis in river basin planning and develop models that would examine alternatives for achieving interim objectives and time-phased construction schedules as well as final water quality objectives. GAO urged that consideration should be given to primary treatment as an interim measure when such treatment

would result in water quality enhancement (111). In addition, GAO recommended that FWPCA consider making water quality data from its storage and retrieval of data (STORET) system available to the States for use in their planning and priority setting activities (112).

FWPCA responded to the GAO report by agreeing that it must use a more systematic method of awarding construction grants and that it would make the STORET system available to the States. But FWPCA did not agree to interim plans that could require less than secondary treatment (113). Instead, in July 1970, the Secretary of Interior promulgated two regulations that changed the planning basis for awarding construction grants. The purpose of these regulations was to make sure that, in the future, Federal money would not be wasted building municipal treatment plants in communities where there were no programs to deal with major pollution from industries and other sources. Another purpose was to encourage construction of regional treatment facilities that could handle sewage from several communities and a variety of types of industrial waste (114).

One of the July 1970 regulations provided that all projects eligible for grants must be included in an "effective current basin-wide plan." This basin plan must identify the volume of discharge, character of effluent, present treatment, and water quality effect of every significant waste discharge in the basin and prescribe a detailed time-phased abatement program (115).

The other regulation required all eligible projects to be included in an "official metropolitan or regional plan" for the area of the project. These metropolitan and regional plans had to be certified by the Governor of each State in which the area was included. The plans were required to include: (1) analyses of the effects of anticipated population and economic growth; (2) present and desired water uses in the area; (3) adequacy of waste collection systems; and (4) integration of waste treatment systems to include industrial wastes and wastes from storm and combined sewers. They were also required to analyze the effect of the proposed waste treatment project, taking account of other waste discharges on water quality and on applicable water quality standards (116).

Problems of Industrial Water Pollution

In the eyes of the environmentalist and "good government" organizations who were the organized "clienteles" of the Federal water pollution control program, the greatest flaw in the program (apart from the inadequacy of its funding) was its

perceived inability to deal effectively with industrial pollution (117). FWPCA agreed that industry was the greatest source of point-source water pollution at this time. The agency also agreed (to a considerable extent) that it needed new tools and authorities to deal with this source.

In its first "Cost of Clean Water" report in 1968, FWPCA estimated that, as of 1963, waterborne wastes of manufacturing establishments—measured on the basis of the biological oxygen demand (BOD) of organic wastes and suspended solids only—were three times as great as domestic sewage and were increasing at the rate of 4.5 percent a year, or three times as fast as the population (118). By the end of this period, the agency concluded that its original estimate of industrial BOD was too conservative. Agency investigations led to estimates that the BOD of industrial wastes, as of 1968, was between four and five times as much as that in domestic sewage. One-fifth of industrial wastes were estimated to be discharged through municipal treatment plants and four-fifths were either treated by industry or discharged without treatment (119).

Furthermore, it was well understood that these estimates, considered by themselves, probably understated the polluting effect of industrial wastes (120). In addition to organic wastes that could be decomposed by the biological processes of secondary sewage treatment, industrial discharges contained large quantities of inorganic minerals and chemicals and a growing number of synthetic organic chemicals. These substances could neither be broken down by conventional waste treatment processes (indeed some of them killed the bacteria used in secondary treatment) nor detoxified by conventional drinking water treatment. Many of them caused unaesthetic sights and odors, destroyed fish and wildlife, and persisted in streams for long distances so they could be found in lakes and estuaries far from the point at which they were discharged. And although these substances were seldom found in drinking water or edible fish in sufficient quantities to be obviously dangerous to man, they aroused fears in the scientific community concerning the long term effects of ingesting them. This was because many of them were known to be toxic to man in other circumstances or known or suspected to cause cancer, mutations, or birth defects.

The Federal Role in Industrial Pollution Control

The Federal Water Pollution Control Act acknowledged that the primary responsibility and right to abate industrial pollution (as well as municipal pollution) belonged to the States (121). But the Federal program had come into being precisely because the Nation was dissatisfied with the accomplishments and capabilities of State programs and expected that a Federal

program would make a tremendous difference in the amount of actual pollution abatement that was accomplished. By the mid-1960's, Federal water pollution control advocates felt a great deal of dissatisfaction with the assignment of primary responsibility to State governments and the extent to which this insulated industrial waste dischargers, in particular, from the assistance that could be offered and the pressures that could be brought to bear by the Federal program (122).

At the beginning of this period, the Federal agency had very little direct relationship with or authority over industrial waste discharges. Construction grants were made to municipalities for small projects that generally treated no significant amount of industrial wastes. Enforcement conferences, held between Federal and State pollution control agencies, established abatement facility construction schedules for industrial polluters who discharged wastes directly into waterways. But in their confrontations with these industrial polluters, Federal enforcers were handicapped by lack of authority to require industries to disclose their effluents (123). They were also handicapped by the Federal agency's reluctance or inability to bring to court industrial and municipal polluters who were not openly defying enforcing conference abatement recommendations, but had slipped far behind their abatement schedules (124).

Since the early 1960's, FWPCA officials believed they had a better "handle" on municipal than on industrial pollution because the States provided them with reasonably adequate information concerning location of municipal waste outfalls, treatment provided, and volume of effluent. But no reliable information on industrial discharges was available from the States or any other sources (125).

A National Industrial Waste Inventory

Proposals that FWPCA send out a questionnaire concerning the source, composition, quantity, and points of discharge of industrial wastes, to complete a voluntary national industrial wastes inventory, came to nothing in 1964, 1967, and 1968. This was because the questionnaire form was not approved by the BOB in 1964 and 1967 (126). In 1968, BOB approved the form, subject to conditions of confidentiality that FWPCA rejected because FWPCA believed those conditions would make the information received unusable for enforcement or action-oriented river basin planning (127).¹⁹

¹⁹As defined by the Federal Reports Act of 1942, 44 USC 3501-3511, which authorized BOB to approve all Federal questionnaires addressed to more than 10 persons, confidential information could not be divulged to anyone, except in the form of statistical tables that did not reveal individual data. BOB ruled that responses to the 1968 industrial wastes questionnaire must be treated as

(Continued)

In October 1970, FWPCA was finally permitted to submit a questionnaire (concerning type and volume of effluent, discharge points, and treatment provided) to a small test sampling of 250 industrial plants. The results of this sampling would determine whether to submit the questionnaire in 1971 to 10,000 industrial plants that accounted for 90 percent of U.S. industrial water use. These were the 10,000 plants known either to use more than 20 million gallons of water annually, to have been cited in enforcement actions, or to have been included in State water quality standards implementation plans. Eventually (with the cooperation of the States) FWPCA hoped to survey all 86,000 plants on its lists of plants in seven water-using industries. The October 1970 test questionnaire contained a statement that the information collected would be used to carry out programs authorized by the Federal Water Pollution Control Act and made available to other Federal agencies, State, interstate, and local water pollution control agencies, and the public, for the purposes of that act (128).

The Water Quality Act and Industrial Pollution

Opposition of representatives of industry had played a major part in defeating Senator Muskie's original proposal that the Federal Government set effluent standards for all waste discharges into navigable water. However, the Water Quality Act of 1965, as passed, was considered to have provided FWPCA an effective enforcement tool to use against industrial pollution. This was because the water quality standards enforcement procedure permitted the agency to circumvent negotiations with State officials and seek a court injunction against an industrial plant discharging into interstate waters, after 6 months' notice of receiving water standards violation. At the time of the enactment of the Water Quality Act, it was thought that court actions to enforce the standards would soon become the generally used Federal enforcement procedure. For reasons discussed earlier in this chapter, this did not turn out to be the case.

Industrial Pollution Control Provisions of the Clean Water Restoration Act and Their Implementation

Information Subpeonas. The Clean Water Restoration Act of 1966 also contained a provision that was intended to enable the enforcement conference procedure to deal more effectively with industrial pollution. FWPCA officials had complained that they

(Continued)

confidential because BOB did not consider that industrial firms would be willing to answer such a questionnaire on a voluntary basis without a pledge of confidentiality.

were often handicapped at enforcement conferences because industrial concerns were reluctant to divulge their effluents or to allow Federal investigators to enter their plants. Section 208 (b)(2) of the Clean Water Act attempted to remedy this situation by authorizing the Secretary of Interior to require alleged polluters to file reports concerning the character and quantity of their effluents and the means they used to prevent or reduce such discharges. However, this section contained a proviso that industrial firms would not be required to divulge "trade secrets or secret processes," and there was no provision for checking the accuracy of reports by plant inspection (129).

The Nader study group on water pollution was to assert in 1971 that FWPCA officials had such strong doubts of the efficacy of the information subpoena provision that they had never attempted to use it (130). Instead, the agency continued to try to persuade industrial firms involved in conference proceedings to submit information voluntarily, either directly or through the States, and to permit FWPCA investigators to inspect their plants. When the industrial firms refused, FWPCA investigators continued to monitor plant effluents in the receiving waters (131).

Assistance to Industry. The authors of the Clean Water Restoration Act were sensitive to the burden imposed on industrial firms by the requirement to install treatment facilities in factories designed and built without them. They were particularly aware of the problems of marginal enterprises that might be forced out of business by the required capital investment (132). As a result, the Clean Water Act contained several provisions designed to assist rather than to compel industries to control their waste discharges.

The most important of these was removal of dollar ceilings on individual municipal construction grants and raising the Federal cost share from 30 percent to as much as 55 percent. The Senate Subcommittee on Air and Water Pollution made it quite clear that it favored awarding the liberalized construction grants to public agencies for joint municipal-industrial treatment facilities. The subcommittee considered that this would greatly increase the amount of industrial waste that received any treatment, provide economies of scale and savings in operating costs, and help marginal (as well as profitable) firms control their waste discharges (133).

In the next few years, it became apparent that industry was making greater use of municipal treatment plants. FWPCA's "Economics of Clean Water" report in March 1970 stated that a substantial part of the demand for public waste treatment capital resulted from the use of municipal systems by industry

and estimated that factories were now producing at least half of the wasteloads in municipal treatment facilities (134).

A May 1970 GAO report to Congress showed that FWPCA had carried out the intent of Congress to encourage joint municipal-industrial waste treatment, but that carrying out this Congressional intention had some unforeseen consequences.²⁰ A large proportion of Federal grant money awarded since 1967 had been for construction of facilities that treated substantial amounts of industrial wastes. Nonetheless, FWPCA had not required the affected industries to finance any part of either the Federal or the municipal share of the project cost. Individual contributions, if any, to construction costs of waste treatment facilities were based on agreements made between industrial waste dischargers and sponsoring municipalities. Consequently, construction costs of industrial waste treatment facilities were subsidized by the Federal Government and in many cases by municipalities as well (135). In addition, GAO found instances of highly inefficient joint municipal-industrial waste treatment systems. Industrial wastes treated in some municipal facilities contained (1) toxic substances that impeded the bacterial action needed for secondary treatment; (2) corrosive substances that damaged treatment plant metal parts; or (3) process residues—such as fur, feathers, entrails, and grease—that impeded treatment plant operation (136).

The GAO report did find that it was desirable to encourage joint treatment of municipal sewage and many types of industrial wastes because of economies of scale, savings in operation and maintenance, and complementarity of treatment processes. But the report contended that it was undesirable and counterproductive to subsidize industrial waste treatment in municipal facilities. This was because industrial firms that could avoid paying the full costs of treating their wastes were less inclined to reduce their wasteloads by adopting process changes or better housekeeping and operating procedures (137).²¹ The overall effect of this type of subsidy might thus actually be to increase industrial pollution.

As a result of the GAO report, FWPCA agreed to review and revise its policies concerning grants to municipalities for facilities treating industrial wastes. In July 1970, the agency promulgated new regulations which provided three new requirements:

²⁰The GAO report also showed that FWPCA had made some grants to public agencies for projects that treated only industrial wastes. GAO questioned whether this was really intended by Congress.

²¹GAO's arguments on this point consisted of quotations from ABT Associates' 1967 report to FWPCA on "Incentives to Industry for Water Pollution Control," (discussed later in this chapter).

- (1) In order to be eligible for construction grants, projects treating industrial wastes must be part of an integrated waste disposal system for a community, metropolitan area, or region.
- (2) Any industrial wastes that would be detrimental to treatment works or operation without pretreatment must be pretreated.
- (3) Each construction grant application for a project treating industrial wastes must assure the agency that it would employ "an equitable system of cost recovery," which would provide for assessment and recovery of both the amortized capital costs and the operating costs attributable to industrial waste treatment (138).

The period covered by this study ended before the regulation requiring recovery of industrial treatment costs was put into operation. The regulation appeared to be capable of substantially eliminating indirect subsidies to industry in grants to municipalities. However, the agency was criticized for not insisting that municipalities utilize "user charges" to recover industrial treatment costs (139). If allowed to choose their own system of cost recovery, municipalities might use such less accurate but frequently employed means of assessing treatment plant costs as water charges, property taxes, or flat monthly sewer charges (140).

The provisions of the Clean Water Restoration Act for demonstration grants to public bodies for new and improved methods of joint municipal industrial waste treatment and the demonstration grants to industry for new and improved methods of industrial water pollution control have already been discussed.

Another study authorized by the 1966 act called for a report by the Secretary to Congress on incentives for industries to reduce or abate water pollution (141). (Incentives authorized to be studied included tax incentives, although the Senate committee report accompanying the clean water bill pointed out that tax legislation was the responsibility of other congressional committees (142).)

An FWPCA contractor's report pursuant to this authorization indicated that tax incentives for investment in industrial treatment facilities (which were already in use under existing tax law) were not an efficient method of encouraging pollution control. ABT Associates pointed out that business firms exist to make money and that investments from which no return could be realized were a serious loss to them, even if partly offset by tax credits. For this reason, industrial firms could not be tempted by tax incentives alone to invest in pollution control, as

long as it was possible for them to avoid or delay doing so. Furthermore, where business firms had decided to abate their pollution—for public relations purposes or to avoid legal sanctions—existence of tax incentives for installing waste treatment equipment might discourage them from choosing more efficient methods to abate their pollution. ABT Associates pointed out that better plant housekeeping, process changes to reduce waste production, or use of land intensive methods such as settling ponds might cost less than installing treatment plants—if there were no tax incentive for the latter—and result in greater reduction in wasteloads (143). As noted in the discussion of the May 1970 GAO report, ABT Associates also questioned the efficiency of subsidizing industrial waste treatment in municipal treatment plants (144). ABT Associates also considered, but rejected, proposals for instituting the effluent charges frequently advocated by economists in this period. The FWPCA contractor's report asserted that the sampling and administrative costs of adequately sophisticated effluent charge systems were likely to be prohibitive, and also that no system that relied on each individual waste discharger to abate his own pollution could be of the highest efficiency (145).

Indeed, the ABT Associates report considered only one proposal capable both of lessening the cost of pollution control to industry and providing efficient pollution control. This was the creation of river basin pollution control authorities that would be responsible for all waste treatment in their areas. Such river basin authorities, the report explained, could be authorized to construct, operate, and maintain public treatment facilities for wastes from all sources. This authorization would relieve industrial firms of responsibility for raising capital for construction (which would prevent hardship cases) and for training and supervising treatment plant operators. Such authorities could levy service (or user) charges, based on the average costs of treating wastes of that type and volume. These charges would be less than the cost to each firm for equivalent waste treatment because the authorities would be able to take advantage of economies of scale and of river hydrology. Because service charges would be based on volume of wastes, they would also provide incentive for firms to look for ways to minimize their wasteloads (146).

The report also considered that river basin authorities were the agencies most competent to decide whether upstream water quality storage was needed and to try out proposed new technologies, such as instream aeration (147).

The basic recommendation of the ABT report was that FWPCA encourage the formation of river basin-level water pollution control authorities by awarding such authorities priority

for funds available for demonstration projects and planning and construction grants (148). The validity of this recommendation was later supported by the findings of two previously discussed GAO reports concerning the construction grant program: (1) the November 1969 report on the effectiveness of the program (149) and (2) the May 1970 study of the program as a means of accomplishing industrial waste treatment (150). Several of the July 1970 changes in FWPCA construction grant regulations were intended to channel Federal grant funds, if not to the powerful river basin authorities envisioned by the ABT Associates report, at least to areas that had metropolitan area plans for integration of industrial and municipal treatment facilities (151).

Oil, Toxic Substances, and Phosphates

Even more worrisome than organic industrial wastes to FWPCA and the environmental movement was the increasing waterborne wasteload of synthetic substances, chemicals, and minerals. The effect on public opinion of a series of well reported catastrophes involving pesticides during 1963-64 (and apparently in 1969), oil in 1969, and mercury in 1970, has been discussed in chapter 4.

The Water Quality Improvement Act was passed in early 1970. It repealed the provisions of the 1966 amendments to the Oil Pollution Act of 1924, that had restricted liability of vessel owners to willful or grossly negligent oil spills only. Henceforth, owners of vessels and onshore or offshore facilities would be liable (up to a certain amount)²² for all oil spills, unless the spills were caused by an act of God or the act or omission of the U.S. Government or a third party. The 1970 act also authorized the President to issue regulations determining what quantity of oil discharge would be considered a violation of the Federal Water Pollution Control Act. The act provided penalties for failure to give notice of known violative discharges. It also provided for the preparation of a national contingency plan for oil removal (152).

The Water Quality Improvement Act also authorized the President to designate substances other than oil that were discharged into water as hazardous polluting substances, to establish means for removing them, and to act immediately to remove them. It also authorized him to report to Congress on the desirability of enacting legislation to impose liability for the cleanup on those responsible for the discharge (153). In addition, the 1970 act provided for a study of the effects of pesticides on

²²The dollar limit on liability for spills from vessels was \$100 per gross ton of oil or \$14 million, whichever was lower. The limit on liability for spills from offshore and onshore facilities was \$8 million.

health and welfare for the purpose of developing water quality standards concerning pesticides. The act also provided for a second study concerning methods to control the release of pesticides into the environment (154).

As noted in chapter 4, the discovery in early 1970 that soluble methyl mercury was present in plankton and fish caused FWPCA to ask the Attorney General to prosecute recalcitrant mercury dischargers under the Refuse Act of 1899.

Chapter 3 discussed the controversy over foaming detergents (which had been solved by industrial process changes in 1964) and the impact of the discovery that phosphates in laundry detergents discharged in domestic sewage were probably the principal cause of the eutrophication of Lake Erie. In the second half of the decade, FWPCA attempted to deal with the problem of detergent-stimulated algae growth in lakes and estuaries by awarding grants for demonstrations of phosphorous removal at sewage treatment plants (155), and exerting pressure on detergent manufacturers to reduce or eliminate phosphates in their products (156).²³ But none of the bills banning detergents containing phosphates introduced in 1969 and 1970 were enacted (157).

The consensus in 1970 was that the Federal program, as then constituted, was not coping successfully with industrial pollution. It was also agreed that program changes were needed, not only in comprehensive planning and awarding construction grants, but in enforcement. There was little agreement about the form that changes in Federal enforcement methods should take, however. FWPCA favored strict enforcement of the Water Pollution Control Act following enactment of a list of proposed amendments to eliminate acknowledged weaknesses in its enforcement authorities. The organized environmental movement was more inclined to advocate reliance on court action under the Refuse Act of 1899.

Enforcement in the Second Half of the Decade

Enforcement Conferences

Enforcement of interstate water quality standards did not replace the conference procedure as the principal Federal enforcement tool during 1966-70. However, the administration's 1970 requests for legislation that would make standards

²³In May and September 1970, FWPCA issued press releases containing statements on the polluting effects of phosphates in detergents, accompanied by lists of phosphate levels in brand name detergents. These press releases were well publicized by the mass media.

enforcement easier suggests that such a change was planned for the near future.

The second half of the decade began at the end of a high point of enforcement conference activity. During the three years 1963-65, State Governors and the Secretary of HEW had initiated 17 conferences, including conferences at major centers of industrial and municipal pollution. These included conferences for Lake Erie; the southern end of Lake Michigan, the Calumet River, and other tributaries; the upper Mississippi River around Minneapolis-St. Paul; Pittsburgh's Monongahela River; Youngstown's Mahoning River; and the Hudson River.²⁴ During 1966-68, only nine conferences were convened, including several by the Secretary of Interior under the shellfish clause. Several older conferences were reconvened. In the first 2 years of the Nixon administration, nine more conferences were reconvened.

The conferences that were initiated in the second half of the decade concerned somewhat less important pollution problems (in terms of population and industries affected) than those that began in 1963-66. This caused the Nader study group to assert that FWPCA was misusing its discretionary powers by taking on the easier pollution cases while ignoring obvious major areas of industrial pollution. "Nader's raiders" pointed out that the Secretary of Interior had failed to initiate enforcement conferences for the highly polluted Delaware and Ohio Rivers²⁵ and the Houston Ship Canal (an intrastate waterway that appeared to be in extreme need of a conference under the shellfish clause) (158).

The enforcement conference started in the second half of the decade that dealt with the most important pollution problem was probably the 1968 four-State Lake Michigan conference. This conference was requested by Governor Kerner of Illinois and reconvened in 1969 and 1970. The conferees agreed on a large number of recommendations, some of which were of a preventive nature to protect the Lake's presently high quality waters from degradation. Among the most important recommendations by the conferees were those calling for 80 percent removal of phosphorous in municipal effluent and high levels of waste treatment by municipalities and industries by the end of 1972. In addition, the conference recommended

²⁴See appendix for a complete list of Federal enforcement conferences, 1957-70.

²⁵Both of these highly polluted rivers were under the jurisdiction of interstate compact organizations with planning and enforcement powers. The Delaware River Basin Commission (DRBC) was an interstate Federal agency and the Secretary of Interior was its Federal member. Furthermore, FWPCA was playing a key role in preparing its excellent pollution control action plan, scheduled for completion in the early 1970's.

preparation of an interstate pesticide control agreement supported by State legislation, and made detailed recommendations for control of waste heat (159).

The Lake Superior conference was initiated by Secretary Udall in 1969 as one of his last acts in office. This conference concerned municipal and industrial discharges into the largest and purest of the Great Lakes, including an industrial discharge that had been the subject of environmental protests for a number of years. This was the dumping of taconite tailings into the Lake by the Reserve Mining Company at Silver Bay, Minnesota. Reserve Mining initially defended itself on the ground that the Government could not prove the "interstate harm" required to establish conference jurisdiction. As a result, FWPCA was obliged to undertake a difficult course of investigations to prove that the taconite tailings entered Wisconsin waters in solutions toxic to living organisms. By the end of 1970, the Lake Superior conference had had five meetings of two sessions. Remedial schedules had been agreed on for all other waste discharges, but a remedial program for Reserve Mining was still being negotiated (160).

Another conference initiated in 1966 concerned preservation of uncontaminated Lake Tahoe from the effects of its rapid development as a resort. The conference called for export of highly treated domestic sewage effluent out of the basin by 1979. But Lake Tahoe continued to be threatened by sedimentation, and at the end of the period FWPCA personnel were carrying out a survey of the lake to recommend action (161).

Still other conferences concerned damages to estuarial scenery and wildlife that were the subject of environmental protests in Florida, Alabama, and Long Island. Several of these were requested by State Governors (162).

However, the most important enforcement conference work performed in the second half of the decade was probably the reconvening of conferences initiated earlier. The Calumet River conference, which involved 24 municipal and 59 industrial waste sources in the Chicago-Gary area, had a technical session in 1966 and was reconvened in 1968 and 1969. Substantial compliance with municipal requirements of secondary sewage treatment and effluent disinfection was soon achieved, but 12 sources of industrial wastes did not meet conference deadlines. In the case of two large steel plants—whose effluents contained iron, toxic chemicals, and oil—the conferees concluded that the firms had not made bonafide attempts to meet conference requirements. Secretary Hickel agreed to support actions by Illinois and the Metropolitan Sanitary District of Chicago in seek-

ing compliance by these companies.²⁶ The Illinois attorney general brought suit against the two steel plants and other recalcitrant industrial polluters to ensure completion of recommended remedial facilities (163).

The first and second Lake Erie conference sessions in 1965 had resulted from the pollution problem of the early 1960's that American public opinion considered the worst of all. In the second half of the decade, the cities and industries failed to make the expenditures necessary to accomplish such difficult conference recommendations as maximum phosphorous removal at treatment plants and combined sewer separation. Consequently, little cleanup was accomplished and the Secretary of Interior reconvened the conference in 1967, 1968, and 1970 (164).

The status of compliance reported by FWPCA at the fifth session showed that 78 out of 110 cities for which schedules had been established were behind schedule, with 48 over a year behind. Out of 130 industries, 44 were behind schedule and 38 were over a year behind. In the Lake Erie Basin, largely because of the burden of removing detergent-phosphates from domestic wastewater, municipal polluters were more recalcitrant than industrial polluters. In May 1970, only 28 cities had completed their remedial facilities, whereas 83 industrial plants had done so (165).

Then, in September 1969, FWPCA took a step that suggested there might be a way out of the process of interminable negotiations with foot-dragging cities and industries. The first six "180-day notices" of intent to bring suit for interstate water quality standards violations were sent out; five of them were served on behind-schedule Lake Erie waste dischargers (the City of Toledo, a Toledo steel plant, and three steel plants in Cleveland). Court actions were not taken against these waste sources, but they all agreed to step up installation of their controls. In addition, FWPCA achieved an agreement with the four steel companies that agency investigators could check company compliance by entering and inspecting their plants (166).

In December 1970, 180-day notices were served on the two chief municipal polluters of Lake Erie—Detroit and Cleveland (167). Since Detroit, Cleveland, and Toledo together accounted for about 75 percent of the municipal wastes discharged to the Lake, these 180-day notices, if they succeeded in achieving compliance, would have important consequences.

²⁶This continuing industrial pollution had become a very important environmental movement issue in the Chicago area. The Metropolitan Sanitary District had already brought suit against one of the two steel plants for spilling oil in the Lake.

The Hudson River conference that had first been initiated in September 1965 at the height of the northeast urban water shortage (168),²⁷ also had disappointing results and was reconvened in 1967 and twice in 1969. Some 78 municipalities and 238 industries were involved in creating a level of pollution that interfered with and, at New York City, virtually eliminated every use of water except waste transport and commercial navigation.

The conferees had agreed that all municipal discharges must receive a minimum of secondary treatment and effluent disinfection (169).²⁸ Industrial discharges were also to receive a high level of treatment. The Secretary recommended a detailed schedule calling for most facilities to be completed by January 1970.

A majority of the waste sources had not met the time schedule when this date arrived. Much of the slippage in construction schedules was attributed to the need to wait for regional planning studies. In May 1970, FWPCA served an 180-day notice on one industrial polluter, New York Central Railroad at Harmon, New York, which agreed to step up its control measures (170).

The reconvened enforcement conference of which FWPCA was most proud was the 1969 session of the Potomac conference. The agency considered that this was the conference session that made the best use of what it had learned was needed in terms of treatment technology and effluent standards (171).

The two previous sessions of the Potomac conference, which were concerned with mainly municipal pollution of retentive estuarial waters, had been held in 1957 and 1958. At that time, the population of the Washington metropolitan area had been much smaller than it was in 1969, but the river presented health, sight, and odor problems that made it unsuitable for recreation and wildlife. The primary cause was inadequate sewage treatment (172).

The most important conference recommendations of 1958 had concerned the District of Columbia's Blue Plains sewage plant, which was then serving 83 percent of the area's population. The

²⁷The Hudson River conference was called largely in response to the New York City water supply shortage of the summer of 1965. It was one of several Federal attempts to find means to deal with future "drought" situations other than additional diversion of Delaware River headwaters.

²⁸The 1965 Hudson River conference recommendations, like those of most conferences during 1965-69, recommended "secondary treatment" without specifying the BOD reduction required. Well-designed and efficiently operated secondary treatment can eliminate 80 to 90 percent of BOD. But when the Hudson River conference was reconvened in 1967, it was found that the new North River plant that New York City planned to build had been designed to reduce BOD only 60 to 65 percent.

conference had recommended that Blue Plains be brought up to 80 percent BOD reduction plus disinfection, and that a major expansion of plant capacity be made by 1965 so that overloading would not reduce treatment efficiency. It also recommended that the District make plans sufficiently in advance to be ready to construct whatever additional treatment capacity might be needed after the 1965 addition was completed. In order to keep raw sewage from being flushed into the Potomac whenever it rained, the District had also been ordered to complete, by the end of 1966, the storm sewer construction program it had begun in 1937 (173).

As a result of slippage in construction schedules, continued population growth, and failure to comply with the 1958 recommendations for advanced planning, the goals of the 1957 and 1958 Potomac enforcement conference had not been accomplished by 1969. The sight and odor problem of the late 1950's were much improved (174).²⁹ But the coliform count was so much higher than it had been in 1958 that the use of the river for swimming and water skiing, which had been the objective of the 1958 abatement plan (and of President Johnson's program for "the Nation's river"), now seemed more unattainable than ever (175).

The Potomac conferees agreed on a new sewage treatment program in early 1969. This plan not only made recommendation for specific and very high percentage removal of BOD (96 percent), phosphorous (96 percent), and nitrogen (85 percent), but placed limits on the permissible volume of these substances to be discharged. Exact numerical limits were set on all three of the major pollutants, in pounds per day of loading. The load limits were portioned out among the five major waste treatment plants discharging into the relevant stretch of the river. In addition, the District agreed to complete another 38 percent of its storm sewer project by 1971. (Only 40 percent had been completed by 1969 (176).)

In 1970, the conferees agreed on a plan to accomplish the required degree of treatment through improvement of Blue Plains and construction of a second regional facility. Secretary Hickel endorsed the plan but objected to the 1977 date for completion of the tertiary treatment components, recommending that the date be moved forward to 1974. The conferees agreed that the District would complete the facilities by 1974, but it was understood that this would depend on the availability of Federal, State, and local funding (177).

²⁹As FWPCA's enforcement chief, Murray Stein, was to explain—by the end of the 1960's, the river smelled only in August "when the algae die off"—not all the time, as it had during the 1950's.

Considered all together, the enforcement conferences that were either begun or continued in the second half of the decade were characterized by agreements to install more or less adequate remedial measures, according to time schedules that were seldom completely lived up to (except in smaller areas with discrete problems, such as Lake Tahoe). The Federal Water Pollution Control Act provided that polluters who did not comply with conference recommendations could be called up before a hearing board, and then if still recalcitrant, before a court (178). But these authorities had not been used since the 1950's. Instead, when actual abatement fell too far behind compliance deadlines, the conferences generally reconvened to inquire into reasons for lack of progress. This resulted in unfavorable publicity for industries or cities not complying with their abatement schedules and in promises (which might or might not be kept) to complete the recommended facilities at a somewhat later time. If sufficient compliance was not achieved after the second session of the conference, it might be reconvened again with the same ambiguous results (179).³⁰

Consequently, there was a great deal of feeling among environmentalists that enforcement conferences had not proved to be an adequate abatement tool (180). FWPCA officials pointed out, however, that compliance with recommendations of the 51 conferences called by the end of 1970 had already resulted in expenditures of almost \$6 billion on treatment facilities (181).

Standards Enforcement

Water quality standards enforcement had originally been heralded as an expeditious method of subjecting a polluter to court sanctions. In practice, when FWPCA issued its first fourteen 180-day notices in 1969 and 1970, it instituted an informal hearing procedure to negotiate settlement of standards violations prior to filing of suit. But in every case (probably because waste dischargers *could* be brought to court in 6 months) this procedure produced an agreement (182).

All but two of the first fourteen 180-day notices were served on standards violaters who were also in gross violation of enforcement conference requirements (183). The seven 180-day notices that were served on recalcitrant Lake Erie conference waste sources and the one that was served on a Hudson River

³⁰As the Nader study group was to point out, even this process was not automatic. There were some cases, such as the 1965 Mahoning River conference at Youngstown, Ohio, where FWPCA did not reconvene the conference, even though compliance with abatement recommendations was very poor. It may be that FWPCA officials did not think it would be productive to reconvene enforcement conferences in areas where the environmental movement was not strong.

conference waste source have been mentioned above. In addition, 180-day notices were served on Atlanta, Georgia (which was greatly in violation of the timetable set by the 1966 Chattahoochee River conference), Fargo, North Dakota (which was not complying with the 1965 Red River of the North conference recommendations); and a Kansas drainage district (which had failed to comply with either the 1957 recommendations of the Missouri River-Kansas City metropolitan area conference or the orders of the public hearing called by the Secretary of HEW in 1960). Another 180-day notice was issued to a New Jersey chemical company that discharged into the highly polluted Arthur Kill, because the company was still greatly in violation of the abatement requirements of the 1961 Raritan Bay conference.

Thus, although no 180-day notices were tested by court action in this period, they appeared to be an effective tool to use in the hardest cases—the small but powerful group of cities and industries that had ignored both the public opinion pressure exerted by Federal enforcement conferences and the police power of State water pollution control agencies. These 180-day notices appeared to be particularly well suited to action against cities. This was because abating the pollution of a few well-chosen cities of this type might have a significant enough impact on the quality of a waterway to justify the investigations necessary to sustain FWPCA's burden of proving violation of receiving water standards and interstate harm. On the other hand, it was doubtful whether individual 180-day notices to industrial polluters would have much effect, because industrial pollution was usually the result of the discharges of many factories on the same waterway.

If Federal standards enforcement could be expected to have any significant effect on the many tens of thousands of continuing discharges that were polluting American waterways, it was not yet apparent (184).

The Refuse Act of 1899

As already noted in chapter 5, the Refuse Act of 1899 was "rediscovered" late in 1969. This old, little-used statute was found to be a means by which U.S. attorneys could completely ignore the pitfalls of administrative procedures under the Water Pollution Control Act and secure court injunctions and criminal penalties against industrial polluters (185). This discovery was greeted with great enthusiasm by individual environmentalists and environmental organizations who had by now despaired of the effectiveness of either the Federal Water Pollution Control Act or State laws. In the first few months of 1970, environmentalists flooded the

offices of local U.S. attorneys with requests to take action against many hundreds of alleged industrial polluters (186)³¹.

The Refuse Act was section 13 of the Rivers and Harbors Act of 1899. Section 13 flatly stated that it was unlawful to discharge "any refuse matter of any kind or description whatever" (with the specific exception of municipal sewage) into navigable waters, without a permit from the Chief of Engineers. Section 13 also stated that the Chief could permit such discharges "under conditions prescribed by him," provided prior application had been made (187). But no administrative machinery for permitting discharges under section 13 had ever been set up.

Section 13 was part of a statute that codified the Corps authorities to protect navigation (188) and had been used by the Corps to bring suit against industrial firms that dumped obstructive solid wastes or (after 1966) flammable oil into navigable channels. But during the 1960's, Supreme Court decisions made it apparent that the courts would follow the literal meaning of the words of the statute and interpret any industrial waste discharge in water to be prohibited without inquiring into its effect on navigation (189). Furthermore, although section 17 of the act provided only for criminal penalties, the Supreme Court had ruled that the Government might also seek an injunction requiring polluters to prevent future discharges and to clean up substances already discharged (190).

The advantages of prosecuting industrial dischargers were obvious. The Refuse Act provided civil remedies in the form of court orders to perform specific abatement measures. It also was a criminal statute that made any firm caught violating the law subject to penalties that were certain, if not necessarily harsh (191).³² Furthermore, grand juries drawing up indictments could subpoena company officials and compel them to disclose their processes and known effluents under oath, since corporations did not enjoy fifth amendment privileges under criminal law. Grand juries could also compel companies to perform

³¹Section 17 of the act, which provided that violation of section 13 was a misdemeanor punishable by a fine, not to exceed \$2,500, also provided that the court could award one-half the fine to persons giving information leading to conviction. Representative Reuss' subcommittee generated tremendous interest in the law by publishing a report maintaining that a private citizen who informed a U.S. attorney of illegal discharges was entitled to such an award. More importantly, the report said that such a private citizen could file a "qui tam" action against the discharger to collect his or her half of the fine, if the U.S. attorney refused to sue.

³²The statute provided that corporations could be fined a minimum of \$500 and a maximum of \$2,500 and that, in the unusual case where the discharger was a natural person, he could receive a prison term of 30 days to 1 year. In 1970, \$2,500 could have been a trivial fine to pay for a continuous discharge, but defendants were routinely charged with separate counts for each manufacturing shift.

tests to find out all the contents of their effluents, if these were unknown (192).

Proceeding against industrial polluters under the Refuse Act, rather than the Water Pollution Control Act, also meant that jurisdiction was not limited by geography and that there was no need to prove interstate harm. Neither was there any need to attempt the difficult proof of violation of receiving water standards.

The most obvious defect of the statute was that there was no need to prove pollution either. The Refuse Act prohibited all discharges of industrial wastes, no matter how small, and without respect to how much harm they did, unless they were permitted by the Corps of Engineers. Moreover, Corps permits were virtually non-existent.

Defenders of the Refuse Act asserted that, in actual practice, prosecutors and judges under the Refuse Act adopted a standard for industrial waste treatment of "maximum feasible abatement under present technology." They contended that this "standard" was easier to understand, harder to evade, and easier to enforce than either receiving water or effluent standards. They also contended that this approach was more efficient. This was because standards for industrial discharges would surely become more stringent over time, and it would ultimately be more costly to allow companies to install less than the most advanced equipment to conform with soon-to-be outmoded standards (193).

At first—perhaps until the caseload resulting from congressional and citizen requests became unwieldy—U.S. attorneys appeared intrigued by the challenge of bringing actions under the Refuse Act. Between October 1969 and April 15, 1970, 66 prosecutions were initiated (194). But FWPCA was dismayed because an extensive program of prosecuting polluters under the Refuse Act would be inconsistent with both the policies and procedures of the Federal Water Pollution Control Act (195). In particular, Federal actions seeking injunctive relief against industrial discharges would violate the congressional directive against displacing the responsibilities and rights of the States, since most States had their own system of enforceable discharge permits (196).³³ It also seemed unfair that companies in full compliance with State and Federal water quality standards or enforcement conference recommendations should be vulnerable

³³Environmentalist attorney William H. Rodgers was to assert, however, that it was "inarguable" that State permit programs were adequate at that time, because they were insufficiently comprehensive, not demanding enough, and badly enforced. Moreover such other observers as the GAO, N. William Hines, and the Nader study group agreed with him.

to prosecution under another Federal authority, on the ground that they had not secured an unavailable permit.

Indeed, if the Federal Government were to prosecute a large number of industrial waste dischargers under the Refuse Act, equity considerations required that the government establish a program for issuing the permits authorized by the statute. But the Refuse Act assigned responsibility for administering this program, not to FWPCA, but to the Corps, an agency with no technical expertise in waste treatment. It must have also been apparent to FWPCA that authority to issue discharge permits, conditioned on water quality considerations, would amount to the same thing as authority to establish a nationwide system of effluent standards, except that it would exclude effluent standards for municipal discharges. And in 1970, the Secretary of Interior asked Congress to give FWPCA authority in pending Water Pollution Control Act amendments to set effluent standards to use in standards enforcement.

Thus, the conflict between the policies, procedures, and assignment of agency responsibilities of the Refuse Act and the Water Pollution Control Act appeared to call for some kind of accommodation. Between mid-1970 and the end of the year several kinds of accommodations were attempted.

In late spring of 1970, the Department of Justice, after consulting with the Department of Interior, began formulating a set of policy guidelines to instruct U.S. attorneys on the appropriate use of the 1899 Act (197). The guidelines, which were issued in June 1970 (198), explained that the Department of Justice would not use Refuse Act enforcement as a pollution abatement device in competition with the Federal Water Pollution Control Act or with State pollution abatement procedures. Instead, it would use the Refuse Act to supplement those other authorities by bringing actions either to punish occasional or recalcitrant polluters or to abate certain sources of pollution that for some reason had fallen through the gaps in Federal and State agency abatement procedures. U.S. attorneys were specifically instructed not to initiate Refuse Act suits, without prior approval of the Washington office, when:

- (1) The discharges were of a continuing nature, resulting from the ordinary operations of a manufacturing plant; or
- (2) The activities of the defendant had already been subject to an "administrative proceeding" of FWPCA; or
- (3) The defendant was a State or local government or was acting pursuant to a license (such as a discharge permit) from such State or local government.

In other words, U.S. attorneys were directed to respond routinely to citizen requests for action, under the Refuse Act, only in situations (such as the solid waste dumpings and oil spills)

that Corps requests for Refuse Act prosecutions had traditionally been concerned with.

The Justice Department guidelines were bitterly protested by Representative Reuss' subcommittee and by environmentalists in general, but remained in force till the end of this period (199).

In the summer of 1970, two events took place which heralded the beginning of a less restrictive Refuse Act enforcement policy. First, the Justice Department, at the request of FWPCA, filed 10 civil actions under the 1899 law against industrial firms that were discharging highly toxic mercury into the Nation's waterways in the course of their ordinary manufacturing processes (200). Second, the Corps of Engineers announced that it was henceforth requiring all dischargers of industrial wastes into waterways to apply for permits. Applicants for permits would be required to submit data concerning the character, amount, and frequency of their discharges (201). Furthermore, such applicants would also be required to comply with the requirement of an April 1970 enactment, section 21(b) of the Water Pollution Control Act. This provision required all applicants for Federal licenses or permits to conduct activities that might affect water quality to file a certification from the appropriate State that the discharge would not violate "applicable water quality standards" (202).

Since the institution and enforcement of a Federal permit program was inconsistent with the views of the Justice Department and FWPCA, the new Council on Environmental Quality called a conference of all agencies concerned. This resulted in an executive branch decision that the Refuse Act should be integrated into the Federal pollution control program in a systematic way and be used to enforce water quality standards rather than be used on an ad hoc basis as an emergency measure (203).

Consequently, on December 23, 1970, President Nixon issued Executive Order 11574, which provided for the institution of a Refuse Act Permit Program (RAPP) to be jointly administered by the Corps and the new Environmental Protection Agency (EPA). (EPA had acceded 20 days earlier to all the authorities and responsibilities of FWPCA.) The Corps was made responsible for all the paperwork involved in permit administration but was required to obtain and follow EPA's advice respecting applicable Federal water quality standards. Applicants for Corps permits were also required to comply with the provisions of section 21(b) concerning State certification.

The RAPP program required a permit for all industrial discharges into navigable waters. Violators of water quality standards—including standards imposed by EPA when Federal-State or State standards did not apply or were clearly

deficient—would be ineligible for a permit. Consequently, such violators would be liable to criminal prosecution and injunction under the Refuse Act. All dischargers would be required to file basic information on their discharges by June 1, 1971, but a later deadline was provided for certain more detailed or difficult-to-obtain information (204).

It was apparent at the end of 1970 that the RAPP program, when it was established (205),³⁴ would make it possible for EPA to do a number of things that FWPCA had sought unsuccessfully to do under the Water Pollution Control Act. These activities would include: (1) discovering the composition and volume of industrial effluents; (2) setting effluent standards; (3) motivating industrial firms to live up to cleanup requirements; and (4) bringing polluters to court without unnecessary delays or the burden of difficult-to-prove and irrelevant jurisdictional requirements. In addition, RAPP would make it easier to compel changes in the manufacturing processes that resulted in discharges of oil and toxic substances, since these effluents could be made ineligible for permit.

Federal Self-Regulation

The second half of the decade saw the same pattern that had characterized the early 1960's—fairly adequate paper planning for pollution control at Federal installations, followed by insufficient funding to carry out the plans. Despite two Johnson administration executive orders that called for an organized program of Federal self-regulation, relatively little was accomplished (206).

However, the year 1970 proved to be a turning point in this aspect of environmental protection, as in so many others. In February 1970, President Nixon issued Executive Order No. 11507, which set a target date of December 31, 1972, for Federal compliance with applicable water quality standards (207). It gave FWPCA responsibility for setting special water quality standards for Federal facilities in areas where none existed—or where it judged that more stringent standards were needed—and performance standards for abatement facilities. But the

³⁴The RAPP program itself was fated to be discontinued in December 1971, before it was fully established. This was the result of a U.S. District Court decision in *Kalur vs. Resor* that permits could not be granted until Corps regulations were amended to require environmental impact statements under the National Environmental Policy Act. But the obvious enforcement potential of the RAPP program was to convince both EPA and Congress that effective enforcement of water pollution control programs—and the future Federal program—must be based on effluent limitations specified in discharge permits.

most significant section of the 1970 executive order was probably the section which prohibited heads of Federal agencies from using funds appropriated for pollution control for other purposes.

A few months later Congress approved an amendment to section 21 of the Water Pollution Control Act, which directed all Federal agencies to ensure compliance with applicable water quality standards "consistent with the paramount interest of the United States" (208).

Executive Order 11507 required heads of agencies to submit plans for pollution control to the Director of the Budget before June 30, 1970. On the basis of these plans, an estimate of \$359 million to meet the 3-year goal of the executive order was arrived at and \$113 million was appropriated for fiscal year 1971. In contrast, an average annual appropriation of only \$52 million had been made for the Federal cleanup in the 3 previous years (209).

What Cost for Clean Water?

The questions of how much water pollution abatement ought to cost, how much of that cost ought to be borne by the Federal Government, and the more basic question of how clean should water be required to be, were of great concern to both the legislative and executive branches of the government in this period. They were also questions of great concern to the organized environmental movement.

In the midsixties, both the legislative and executive branches thought in terms of a "backlog" of needed treatment facilities (210). The estimate of the environmental pollution panel of the President's Science Advisory Committee in November 1965 was that it would require a total investment of \$20 billion during the next 10 years to provide secondary sewage treatment for 80 percent of the Nation's population (211). On the basis of this, in early 1966, the Senate Subcommittee on Air and Water Pollution recommended a Federal investment of \$6 billion over a 5-year period (212). Later that year, the Clean Water Restoration Act authorized \$3.4 billion for the 4-year period, 1968-71 (213).

The events that resulted in a \$1.2-billion gap between this authorization and the actual appropriations enacted during 1967-70 have already been discussed in chapter 4 and referred to earlier in this chapter.

The Clean Water Restoration Act also directed FWPCA to undertake an estimate of the national requirements for and the costs of treating municipal, industrial, and other wastes to attain State and Federal water quality standards in the next 4

years and to update it annually (214). The first FWPCA estimate under this authority, in 1968, was that \$8 billion would be needed to finance sewage treatment plant construction during 1969-73 to provide secondary sewage treatment for 75 percent of the population. Between \$2.6 and \$4.6 billion would be required to supply the equivalent of secondary sewage treatment to organic industrial wastes in the same period (215). Estimated costs of controlling combined sewer overflows were between \$15 and \$49 billion, depending on the methods chosen (216).

By the time of FWPCA's third report in early 1970, FWPCA economists believed the cost to all levels of government of needed municipal treatment facilities would be \$10 billion in fiscal years 1970-74 (217). This estimate was the basis of the 4-year, \$4-billion construction grant program that President Nixon proposed in February 1970 and the administration's \$1-billion budget request for 1971 (218). But another FWPCA poll of the States and cities in July 1970 resulted in a fresh cost estimate of \$12 billion for fiscal years 1972-74, and a proposal that the Federal cost share be \$6 billion (219).

The 1970 cost estimates sponsored by the Chairman of the Senate Subcommittee on Air and Water Pollution were higher. A joint report by the National League of Cities and the U.S. Conference of Mayors arrived at sums of \$33 to \$37 billion over a 6-year period for presently needed treatment facilities, including facilities that provided more than secondary sewage treatment and combined sewer separation. This report advocated a Federal construction grant program of at least \$2.5 billion a year (220).

The question of how much clean water should cost, which was such an important issue in politics of water pollution control in the late 1960's and 1970, was obviously destined to remain one in the 1970's. Although it was clear that the Nation was prepared to pay more for clean water in the seventies than it had paid in the sixties, it was not clear how much more.

The Creation of EPA

On July 9, 1970, President Nixon sent a message to Congress proposing the reorganization which, when it went into effect 4 months later, abolished FWPCA, removed responsibility for implementation of the Federal Water Pollution Control Act from the Interior Department and assigned it to the new Environmental Protection Agency (221). Reorganization Plan No. 3 (222) took effect on schedule and EPA opened for business on December 2, 1970. The plan also assigned to the new agency responsibility for carrying out legislative authorities that had

previously been scattered among a half dozen other agencies (for air pollution control, solid wastes management, pesticides control, and radiation control programs). But almost 80 percent of the manpower and money that was reassigned came from FWPCA (223).

Reorganization Plan No. 3 was the result of changes in public perception of the nature and extent of environmental degradation and of the relative importance of water resources development and water pollution control discussed in chapter 4. It purported to remove pollution control programs from Government departments (such as Interior) that also had responsibility for resource development (224) and to place them in an agency that would regard the environment as a "single interrelated system" that must be protected from a variety of pollutants.

Proponents of the reorganization explained that pollution control problems were showing an increasing tendency to involve toxic chemicals and metals that endangered all media—air, water, and land (225). They asserted that in the future, States, local governments, and industries would benefit by being able to go to a single agency to find out what pollution control measures they must take and by the consistent, coordinated environmental quality standards monitoring and enforcement that the new agency would provide (226). Furthermore, they predicted, EPA would be in an ideal position to recognize the emergence of new environmental hazards and problems and develop new programs to deal with them (227).

9. OTHER FEDERAL PROGRAMS, 1966-70

Water and Sewer Facility Programs

The Federal Water Pollution Control Administration (FWPCA) had primary responsibility for providing Federal grant assistance for construction of sewage treatment plants and interceptor sewers. But FWPCA had no authority to make grants for systems for storage, purification, and distribution of public water supplies or for construction of the sanitary and (separate) storm sewer lines required by integrated water pollution control programs. Furthermore, FWPCA had no authority to make loans for any type of project.

Partly as a result of the Johnson administration's interest in the river basin approach to water pollution control and water resources development, several programs providing Federal assistance to water and sewer facility construction were initiated in 1965 legislation. But as a result of interagency jurisdictional agreements, these programs were placed in various programs for community planning or regional economic development and were scattered among a number of agencies with different agency missions (1).

The HUD Program

The largest water and sewer facility program was administered by the Department of Housing and Urban Development (HUD). Section 702 of the Housing and Urban Development Act of 1965 (2) authorized the Secretary of HUD to make grants to local governments of up to 50 percent of the development costs of new or expanded water and sewer facilities (but not sewage treatment facilities) required for orderly community development. A special provision permitted grants of up to 90 percent for sewer facilities for small communities located within metropolitan areas that met specified conditions of need (3). In 1968, this 90-percent grant provision was extended to include water facilities.

After a specified date—which was subsequently extended beyond this time period—section 702 required that projects eligible for grants must be consistent with the water or sewer systems included in comprehensive area development

plans (4,5).¹ Section 702 also required FWPCA's certification that wastes carried by such projects would be adequately treated to meet applicable Federal, State, or local water quality standards before discharge into waterways.

Like FWPCA's construction grant program, HUD's water and sewer facilities program was not funded up to authorized levels during this period. The HUD acts of 1965 and 1968 authorized appropriations of \$1,065 million for fiscal years 1966-70 (6), but only \$555 million was appropriated (7). But, in 1970, Congress rejected the administration's request of \$150 million for fiscal 1971 and appropriated \$350 million (8).

Since application for water and sewer facility grants greatly exceeded available funding, HUD developed a "rating system" to assign priority. This rating system was based on the degree of need for the project, the economies of scale to be achieved, and the fiscal capacity of the local government applicant. Small, low-income enclaves in metropolitan areas, and projects that eliminated public health hazards or improved local employment opportunities were particularly favored (9).

In addition, HUD's construction grant program was frequently supplemented by two other departmental programs that provided smaller amounts of Federal assistance to water and sewer or waste treatment facilities. These were: (1) low-interest, 40-year loans for construction of all types of public facilities, and (2) interest-free advances for planning public facilities, which were repayable when construction began (10).

The FmHA Program

Although HUD's authority to provide assistance for water and sewer facilities was applicable to communities of any size, USDA's Farmers Home Administration (FmHA) was also responsible for a somewhat similar program in communities of less than 5,500 persons. The purpose of FmHA's program, authorized by the 1965 amendments to the Consolidated Farmers Home Administration Act, was to assist rural communities to develop water and waste disposal systems needed for orderly community development. The most significant ways in

¹HUD also had a grant program for preparation of comprehensive area development plans which could, but need not, include a water and sewer facilities component. Section 701 of the Housing Act of 1954, as amended up to 1966, made urban planning assistance available to small cities, larger cities under specified conditions of hardship, and State, regional, and metropolitan agencies. Subsequent amendments in 1966, 1967, and 1968 extended such assistance to local and regional planning agencies of all sizes and variety of types and to States for nonurban area planning. These planning grants were for up to two-thirds of the cost, or three-quarters of the cost in areas designated by the Economic Development Administration. However, they could not be used for preparing plans for specific water or sewer facilities.

which the FmHA program differed from the HUD program were: (1) FmHA could make grants (and loans) to quasi-public agencies and nonprofit corporations as well as public agencies; and (2) all FmHA grants and loans could be used for waste treatment facilities as well as water and sewer facilities (11).

The 1965 Consolidated Farmers Home Administration Act amendments authorized the Secretary of Agriculture to make grants of up to 50 percent of project "development" costs (12)² for water and waste disposal systems. The 1965 amendments also authorized low-interest, 40-year loans for the same types of projects and grants for comprehensive planning of rural water or sewer systems. Like HUD's section 702(c), FmHA's 1965 enabling act required that projects must be consistent with comprehensive water and sewer system plans to be eligible for grants or loans.³ Certification was required (in this case from State pollution control agencies) that projects discharging into waterways would not violate State water quality standards (13).

About \$27 million a year was appropriated for both planning and development grants for fiscal years 1966-69 (14). This figure was increased to \$46 million for fiscal 1970 (15). In 1970, the Department requested \$24 million for fiscal 1971. But Congress, which was now influenced by the environmental movement, appropriated the authorized sum of \$100 million (16).

The EDA Program

Another program that provided assistance to water and sewer projects, as well as other public works, was administered by the Economic Development Administration (EDA) of the Department of Commerce. Under the Public Works and Economic Development Act of 1965, EDA administered a program of grants and loans for land acquisition, construction, and improvement of "development facilities" in designated areas of persistent unemployment and underemployment. This program consisted of basic grants of 50 percent of project costs, low-interest, 40-year loans for the same types of projects and supplementary grants. The supplementary grants—which could increase up to 80 percent the Federal share of project costs—

²Both section 702 of the HUD act and the 1965 FmHA act provided grants for "development" costs. But HUD interpreted this term to include construction and land costs only, whereas FmHA interpreted it to include administrative, legal, and engineering costs as well. FmHA officials explained that FmHA assistance was to small rural communities that could not readily finance their share of project cost through sale of bonds on the open market, and thus needed more assistance.

³But the 1965 Act provided that until October 1968 grants could be made before completion of a comprehensive plan, if one had been "undertaken" for the area. This date was extended to October 1, 1971, by the 1968 amendment to the act.

were used to supplement basic grants or grants under other Federal agency programs, in cases where States, local governments, or other nonprofit community organizations could not pay the matching share.

All projects eligible for grants or loans were required to be consistent with an overall economic development program for the area. And all sewer and waste disposal projects required FWPCA certification that wastes would be adequately treated to meet applicable water quality standards (17).

About \$175 million a year was appropriated for development facility grants and loans during this period. Water and sewer facilities—often in connection with new industrial parks—were among projects for which financial assistance was most frequently made available. But since the objective of this program was to provide opportunities for long-term employment, much of the funding was given to other types of projects, such as airports, access roads, and hospitals (18).

Appalachian Projects

Section 212(a) of the Appalachian Regional Development Act of 1965 authorized FWPCA (not the Appalachian Regional Commission) to make sewage treatment plant construction grants in Appalachia in addition and without prejudice to the grants made in the same region under the Federal Water Pollution Control Act. These basic grants were subject to the same rules for determining the Federal cost share that applied to sewage treatment facility grants under the Water Pollution Control Act. The Federal share could therefore amount to 50 percent if the State agreed to pay 25 percent and the project was consistent with established State water quality standards. It could be 55 percent if the project was also consistent with a metropolitan area plan (19).

In addition, the Appalachian Regional Commission (ARC) was authorized by section 214 of the Appalachian Regional Development Act to supplement a variety of types of Federal grants, including FWPCA grants for sewage treatment and HUD and FmHA grants for water and sewer facilities, among others. The degree of supplementation was determined by the degree of the applicants' financial capability, but the supplementary grant was not permitted to increase the Federal share above 80 percent (20).

Although the 1965 Act and its 1967 amendment (21) together authorized \$12 million for the section 212 basic sewage treatment facility grant program in fiscal years 1966-69, only \$7.4 million was actually appropriated (22). This was partly because of difficulties in coordinating FWPCA grant distribution policies with ARC's policy to concentrate public works investments in

areas with economic growth potential (23). The 1969 amendments did not authorize new appropriations for section 212, and all subsequent ARC assistance to sewage treatment facilities was channelled through the supplementary grant program of section 214 (24).⁴

Under section 214, in fiscal years 1966-69, \$15.4 million was spent on sewage treatment facilities and \$3.3 million on water and sewer facilities (25). In fiscal years 1970-71, as a result of increased emphasis on pollution control, an additional \$8.5 million was spent on sewage treatment facilities and \$8 million on water and sewer facilities (26).

Coordination of Water and Sewer Facility Programs

The jurisdiction of all these Federal agencies to provide financial assistance for similar types of projects was somewhat overlapping. Since this confused communities seeking Federal assistance, an interagency task force was set up to clarify jurisdiction and coordinate programs. This task force—which consisted of representatives of EDA, FmHA, HUD, and FWPCA—developed jurisdictional guidelines. Perhaps the most important accomplishment of the guidelines was to establish that FWPCA was entitled to exhaust all its State allotments for sewage treatment grants to public agencies before EDA and FmHA could exercise their jurisdiction to make such grants. The guidelines also drew attention to the fact that FWPCA and HUD had statutory authority to make grants to public agencies only, but that FmHA and EDA had authority to make grants and loans and HUD to make loans to quasi-public agencies and nonprofit private organizations (27).

The Bureau of the Budget developed a standard form based on these guidelines for preliminary inquiries concerning Federal financial aid for water, sewer, and waste treatment facilities. Interested communities were instructed to file this form with local or State offices of FmHA or regional offices of HUD if the proposed application concerned water or sewer works. They were instructed to file the same form with the State water pollution control agency if it concerned waste treatment works. The receiving agency would review the inquiry promptly. If the project was in an area eligible for assistance under the Public Works and Economic Development Act, a copy would be sent to EDA to enable EDA to relate the project to its overall program or to request jurisdiction. If the project contained waste treatment facilities, it was referred to FWPCA. After examination of

⁴The 1969 amendments authorized use of section 214 grants for approved sewage treatment projects that were not assisted by FWPCA but prefunded by State or local governments, as provided by what was then section 8(c) of the Federal Water Pollution Control Act.

the information submitted in the inquiry, a determination of jurisdiction would be made. The agency responsible for receiving an application for Federal assistance for this project would then advise the project sponsors how to make such an application (28).

In the last years of this period, communities increasingly applied for grants from both FWPCA and HUD or FHA in order to obtain assistance for entire sewer systems, including both collection and treatment facilities (29).

Research and Development Programs

The 1961 recommendations of the Senate Select Committee on National Water Resources that the Federal Government undertake a strengthened, coordinated, multidisciplinary research program was carried out to a considerable extent in the second half of the decade.

Many of the previously established patterns changed only a little. The Department of Interior had already housed such leading water resources research agencies as the U.S. Geological Survey, Office of Saline Water, Bureau of Sports Fisheries and Wildlife, and Bureau of Reclamation. With the creation of the Office of Water Resources Research and FWPCA's transfer from HEW, most of the Federal water research program was concentrated in Interior. However, several agencies in the Departments of Agriculture, Commerce, and HEW, as well as the Corps of Engineers, AEC, National Science Foundation, and TVA, also conducted sizeable water research programs.

Data on the source, quantity, quality, distribution, movement, and availability of the Nation's surface and groundwaters were collected and analyzed by the Geological Survey as before, although FWPCA's water quality network system, which was coordinated with the Geological Survey program, expanded greatly at this time. Climatological data, which had been collected and analyzed by the Weather Bureau, was now gathered by its successor agency in the Department of Commerce, the Environmental Science Services Administration (ESSA). A new participant in the "earth survey" component of water resources research in the late 1960's was the National Aeronautics and Space Administration (NASA). NASA provided funds to the Geological Survey and ESSA to carry out research on the application of techniques of "remote sensing" from airplanes and spacecraft for acquisition of hydrologic data. At the end of this period, NASA was working cooperatively with a number of Federal water agency research programs to develop usable data

concerning snowpack, water pollution, soil moisture, groundwater, wetlands, and vegetation.

Research and development (R&D) programs needed to support construction agency missions were conducted (either in-house or through contracts) by the agencies themselves or by other agencies in the same Department. For instance, USDA's Soil Conservation Service performed no research, but research in support of small watershed programs was performed by the Agricultural Research Service, Forest Service, and Economic Research Service. The "big ticket" engineering R&D to develop new technologies to augment usable water supplies, so strongly urged by the Senate select committee in 1961, continued to be exemplified by the saline water conversion program of the Office of Saline Water. This program, which was funded at the rate of about \$25 million a year in this period, was the largest Federal water resources R&D program until about 1968 when it was surpassed by FWPCA's mission-oriented program, which also contained a component that developed and demonstrated operating "hardware" (30). Another example of ambitious technological R&D was the weather modification program of the Bureau of Reclamation, which had been started at an extremely modest level in the early 1960's, but had grown steadily. As already noted in chapter 6, the Bureau of Reclamation became convinced of the usefulness of this mission-oriented program in the last years of the decade. The weather modification program was expected to expand considerably in the 1970's.

In the second half of the decade, Federal water research programs were coordinated and made more comprehensive than they would otherwise have been by two entities created in the early 1960's. They were the interagency Committee on Water Resources Research (COWRR), and the new Office of Water Resources Research (OWRR) in the Department of Interior. Their early activities were discussed in chapter 2.

COWRR and OWRR

COWRR, an interagency committee of the Federal Council for Science and Technology in the Executive Office of the President, was established in 1963 to advance the Federal program of water resources research. COWRR was directed to identify gaps and inadequacies in member agency research programs and to recommend changes in the scope and direction of future programs. It was also charged with coordination of research planning and responsibility for efficient exchange of information among the agencies.

OWRR was an agency of the Department of the Interior established at the end of 1964 to carry out the Water Resources Research Act (31). OWRR's responsibilities under that act were:

(1) to provide support for 51 university-based water resources institutes that would conduct research on all aspects of water resources; (2) to make grants to and contracts with other universities and public and private agencies for water resources research related to the missions of the Department of Interior, and (3) to widely disseminate the results of the research conducted under the act.

COWRR was able to make considerable use of the flexibility of OWRR's mission, and the availability of OWRR's uncommitted research funds to fill in gaps in water agency research programs that became apparent as the Nation became concerned with new issues. Thus, in 1967, COWRR was able to designate OWRR as the "lead agency" to begin a program of improving water resources management in urban and metropolitan areas. OWRR agreed to undertake responsibility for (1) identifying urban water resources research needs, (2) encouraging other agencies to do needed research and coordinating their efforts; and (3) sponsoring, as part of its own program, whatever needed research others were unable to perform (32). OWRR then elicited the support of the water research community to identify urban water research needs and basic information needs concerning urban hydrology. In 1969, the Secretary of the Interior directed OWRR to prepare a national urban water resources research program that would provide for input by Federal agencies, State and local governments, universities, and other research organizations (33).

COWRR also obtained the cooperation of OWRR's research grant program in sponsoring university research in other areas that the interagency committee considered were receiving inadequate attention from action agency research programs. These areas included water resources planning, water supply conservation, and the hydrologic cycle (34). In addition, the Secretary of Interior accepted COWRR's recommendation that OWRR make its departmentally-oriented Water Resources Scientific Information Center into a service for the dissemination of results of all Federally-supported water resources research (35). COWRR also saw to it that all its member agencies reported on their research activities to the annual water resources research catalog prepared by the Science Information Exchange of the Smithsonian Institution under the management of OWRR (36).

COWRR was less successful in its attempt—through its 10-year program and annual reports—to guide congressional and executive branch decisions concerning development and funding of Federal agency research programs.

The 10-year program, which became known as the "Brown Book," identified 14 major problem areas for priority, divided

the entire Federal program into 45 research and 4 support subcategories, and made program recommendations for each subcategory for the first 5 years—fiscal years 1967-71. These funding levels would have increased the total Federal water research program from \$92 million in fiscal 1966 to \$199 million in fiscal 1971 (37, 38).⁵ However, the plan did not break down its program and funding recommendations into specific agency assignments.

In addition, COWRR's annual reports of the total ongoing Federal research program, which used the same research categories as the "Brown Book," contained recommendations that certain areas of research be given priority (39).

The priority research areas identified in the "Brown Book" were somewhat different from the ones urged in annual reports, which in turn varied slightly from year to year. But water resources planning and related institutional and socioeconomic problems were consistently stated to be priority research areas, as also were various aspects of water quality management, other environmental problems, and urban problems (40).

In September 1968, a report on COWRR's activities was made by a panel of consultants to the Office of Science and Technology (OST).⁶ This report asserted that although COWRR's influence had resulted in allocation of more funds to priority research areas than would have otherwise been made, most priority research areas were being funded substantially behind dollar goals set by the "Brown Book." The OST panel report asserted that COWRR had difficulty stimulating in-house research in urban water problems and had been particularly unsuccessful in stimulating in-house research in water resources planning, the category to which the 10-year plan had awarded highest priority. Indeed, nearly all research categories were being funded substantially below COWRR dollar goals—except saline water conversion (which was not a priority item and was funded much in excess of COWRR recommendations) and water quality management and protection (which was a priority item, but probably owed little of its "prosperity" to the support of the interagency committee) (41).

⁵The degree of increase advocated by the "Brown Book" did not take place. COWRR's annual report for fiscal 1971 was to show that total Federal water research expenditures in that year were only \$136 million. But the fiscal 1971 figure was somewhat lower than it would have been if it had included Office of Saline Water expenditures for development and demonstration projects, which were no longer defined as research. These expenditures had been included in the "Brown Book" and amounted to about \$20 million in fiscal 1968, the last year they were included in COWRR's Federal research program figure.

⁶Four of the eight consultants were current or former members of the OST staff who had served 1-year terms as chairman of COWRR.

The OST panel report also criticized COWRR for not issuing its annual reports early enough or making other timely arrangements with the Federal Council for Science and Technology, the Bureau of the Budget, or congressional committees to have more impact on the budgetary process (42). The panel also suggested that the form in which COWRR presented its budgets—research categories and subcategories—made it difficult to demonstrate the relevance of ongoing research programs to the Nation's water problems. It recommended that an alternative analysis based on major water management problem areas would be useful (43). In addition, the panel suggested that it would be easier to attain future implementation of budgetary recommendations if research categories were translated into specific agency assignments (44).

The interagency committee had already completed a review and updating of the "Brown Book" program for fiscal 1970 and had begun a review and updating of the program for fiscal years 1972-75 (45). In 1969, as a result of the OST panel's recommendation, COWRR selected the ten problem areas⁷ it considered would constitute the major water resources research concerns of the early 1970's. In 1969 and 1970, interagency problem area task groups developed comprehensive descriptions of each problem area and the research program needed for each area. They also undertook to assign each task to the appropriate agency, and translate research tasks into the COWRR system of standard research categories. These categories were to be used to estimate expenditures for fiscal 1970 and future budgets (46).

But the work of translating national water problems into research tasks proved difficult because many research projects were related to more than one problem. A decision was made in 1970 to separate annual reporting of agency research programs from long-range analyses of what kind of research would be needed to solve important water problems. COWRR decided to concentrate for the current year on preparations for the long term planning effort. In June 1970, an interagency working

⁷The ten problem areas selected were the following:

1. Improving water resources system planning and management process.
2. Controlling heated discharges.
3. Controlling sediment.
4. Improving water quality.
5. Meeting increased water supply requirements.
6. Mitigating water-caused damages.
7. Conserving ecologic values in water resource planning.
8. Optimizing metropolitan area water system planning, design, and management.
9. Conserving estuarial water resources.
10. Improving methods for dissemination and application of research findings.

conference recommended procedures for problem-oriented analyses of water research requirements that would be used as the basis for revised long-range program recommendations (47).

The Tennessee Valley Authority

TVA, in the years 1966-70, was primarily a resource management organization rather than a water development agency. The largest part of its program was power development and operations, paid for out of power revenues. And, although hydropower operations were an important part of this program, the new facilities under construction in this period were almost entirely steam-electric and nuclear-electric facilities (48).⁸

Of the approximately \$50 million a year appropriated for TVA activities for fiscal years 1969-71, only about \$29 million was for water resources development, construction, and expenses (49).⁹ Even this modest figure overemphasizes the relative importance of water resources development in TVA's program in this period, because construction required more money in proportion to staff time than TVA's other nonpower activities. These other activities included research, planning, development, and demonstrations. They were concerned with fertilizer, munitions, agriculture, forestry, land use, community and industrial growth, recreation, fish and wildlife, and water quality, among other things.

TVA did make replacements and additions to the 32 dams on its main water control system at this time. It replaced a deteriorated dam built in 1913 by a private power company with Nickajack Dam, which had larger navigation locks. It also began work in 1966 on two additions to the system, Tims Ford Dam on the Elk River, which was virtually complete at the end of this period, and the Tellico Dam and reservoir on the Little Tennessee River. As was the case with other water resources developments in this period, construction of the Tellico project was delayed at first by budgetary considerations, and later by environmental protests. By the spring of 1970, its scheduling for completion had been postponed until 1975 (50).

⁸TVA began constructing a large pumped storage project, the Raccoon Mountain project, in this period. Tims Ford multiple-purpose dam would also generate a small amount of hydropower. But these were very small components of TVA's power construction program.

⁹Appropriations were reduced markedly in the middle of this period because of budgetary stringencies. They had been \$70 million for fiscal 1967 and \$60 million for fiscal 1968. Furthermore, most of the budget that was cut was for expensive water resources development rather than resource management.

In the late 1960's, TVA considered that the development of its main water control system for flood control, navigation, and hydropower was successfully accomplishing the regional economic development objectives for which it had been established. TVA pointed with pride to the fact that the region (which as a predominantly agricultural area had long been plagued by out-migration) was now gaining in population at the same rate as the rest of the Nation (51). Furthermore, the valley's per capita income, which had been only 45 percent of the national average in 1933, was now 70 percent (52).

TVA was particularly proud of the contribution of its navigation channel and locks to the region's economic growth. It pointed out that calendar year 1970 was the ninth consecutive year that a new tonnage record had been set and the sixth that a new ton-mileage record had been set for the waterway (53). Furthermore, TVA identified low cost water transportation (combined with planned industrial sites and interconnection with rail and highway transportation) as the principal cause of industrial growth on the waterway's shorelines—and of the entry of new industries into the region. The new industries included chemicals, petroleum products, ferro-alloys, and latex (54).

In 1963, TVA reports had indicated that TVA considered that use of the waterway (within limits) for waste assimilation was one of the inducements to shoreline industrial development (55). In this period, TVA reports emphasized the limits on such use by pointing out that TVA transferred reservoir shoreline sites to industrial developers only if they agreed to treat wastes sufficiently to meet State water quality standards (56).

Tributary Area Development

Much of TVA's new water development work in this period was the product of its tributary area development (TAD) Program. It was based on cooperative planning of local citizens' associations, in cooperation with TVA and State planning agencies. Until the early 1960's, TAD had mainly been concerned with soil conservation, farm management, and forestry programs. In the early sixties, it expanded to include upstream reservoirs, channel improvements, and systems of such developments. These developments had no power or navigation benefits but were justified for flood protection, recreation, municipal and industrial water, shoreline development sites, and water quality improvement. They were somewhat similar to SCS's small watershed projects but were not built on private land. Neither were they subject to the watershed program's requirement that flood prevention be the primary purpose of the project or to the watershed program's limitations on the size of

structures. Tributary areas were typically larger than the 250,000-acre limitation of small watershed areas. TAD projects (like main water control system projects) were selected because of their expected contribution to regional (in this case tributary area) economic development, but were required to be justified by a favorable ratio of national income benefits to costs.

In the later sixties, planning of upstream water developments became an increasingly important element of TAD programs, although construction was held up by tight budgets. TAD also became more involved in this period in the planning and development of water and sewer facilities, industrial parks, recreation facilities, housing on the shorelines of existing or proposed TVA lakes, highways, vocational and general education projects, and solid waste disposal projects. These projects were carried out with the cooperation of State planning and development agencies. Financial assistance was obtained for them from Federal organizations concerned with community and depressed area development, such as HUD, EDA, and the Appalachian Regional Commission (57).

The first of the "tributary area water control systems," the system of seven reservoirs in the Beech River watershed, was completed in 1966. The following year, TVA began construction of a system of 4 dams and 60 miles of channel improvement on the 946-square-mile Bear Creek watershed in Alabama and Mississippi, which was not completed in this period (58). TVA was proud of an environment-protecting feature of this project, a grassed floodway designed to carry floodwaters through an overflow channel, without disrupting fish and wildlife in the natural channel (59). Another larger water control system (which was expected to ultimately cost the Federal Government \$100 million) was the system of 14 dams, 74 miles of channel improvement, and 1.4 miles of levee planned in cooperation with the Upper French Broad Economic Development Commission in North Carolina (60). This project was planned in 1967 but was not started in this period because of budgetary considerations and the opposition of local landowners and environmentalists (61). A plan for two dams on the Upper Duck River was also held up because of budgetary considerations (62).

Smaller TAD projects included two channel improvement projects for local flood prevention. One was combined with the renovation of a flood-prone urban business district (63). The other, the much-heralded Duffield project, which involved cooperative efforts by local and State governments and several Federal agencies, was underway at the end of this period. The Duffield project, which only cost TVA \$500,000, was needed to provide flood protection for the only level sites for industrial development in a severely depressed mountain community. It

was to be coordinated with developments for the highway and rail transportation and water and sewer facilities also required for such development (64).

A different type of tributary area water project was the Yellow Creek port project on an undeveloped embayment on the main stem Pickwick reservoir. This project was coordinated with development of industrial sites by the State and the local water management district (65).

Community Flood Damage Prevention

TVA had been involved since 1953 in a program of assisting State and local governments to adopt nonstructural flood control measures. TVA activities in the program involved the following:

- (1) Community flood situation reports on the height and areal limits of past floods and expected future floods (at the request of local governments);
- (2) Special flood studies (in response to requests from Federal, State, regional, and local agencies, and private land developers) concerning sites not covered by published reports (after Executive Order 11296, which directed all Federal agencies in the region to obtain flood hazard information and technical assistance from TVA for use in a long list of land use decisions, TVA conducted about 100 of these studies a year);
- (3) Technical assistance to solve local flood problems, including help in developing comprehensive community flood damage prevention programs (these programs could include structural as well as nonstructural measures where benefits exceeded costs—in these cases, TVA assumed responsibility for construction) (66).

By the end of fiscal 1971, TVA had prepared 108 reports covering 129 of the 150 communities in the upper tributaries that had local flood problems not controlled by the valley's reservoir system. Some 74 communities had used these reports to adopt flood plain regulations in zoning ordinances or subdivision regulations. Moreover, the reports were used informally by State and local government agencies and private individuals in making individual land use decisions (67).

In 1967, following a flood in the Appalachian coal community of Oliver Springs, Tennessee, TVA prepared a comprehensive local flood damage prevention program involving both flood plain regulation and a 1.2-mile channel improvement. These modest flood control measures were made the key element in a much larger community redevelopment program involving the cooperation of several State and Federal agencies. This program in turn, was based on a comprehensive land use plan made

possible by flood control. It provided new areas for industry, public recreation and housing, expansion and revitalization of the business district, construction of water supply and waste treatment systems, improved educational facilities, and a highway bypass to alleviate downtown traffic congestion (68).

In another community, a TVA-prepared plan for moving bridges and housing out of the flood plain was made the basis of an urban renewal project supported by HUD funds (69).

Environmental Management Issues

As an organization created by the old conservation movement for the purpose of regional economic development combined with community improvement, TVA was severely challenged by the organized environmental movement of the last years of this period.

TVA's basic goal was to encourage job-creating industry and to promote new urban growth in a relatively unpolluted, still largely agricultural region. Throughout this period, TVA's reports and spokesmen asserted that TVA's planning program (which consisted of planned disposition of reservoir shorelines and provision of assistance and leadership to State and local governments in resource management and community planning) was equally well suited to promoting environmental quality as it was to promoting economic growth. They asserted that TVA planning was assisting orderly, attractive, decentralized urban growth in the region and was ensuring that new industrial plants treated their effluents and emissions (70). In support of these assertions, TVA reports further stated that the waters of the Tennessee River system were actually cleaner than they had been in the thirties (71). They also published statistics that showed new employment in manufacturing trades and services growing faster in the region's small- to medium-size communities than in its five largest metropolitan areas (72).

TVA spokesmen and reports also asserted in the late sixties that TVA was monitoring the polluting effects of its own power program (air pollution, thermal water pollution, and environmental degradations resulting from strip mining) and taking measures to control them (73).

TVA water pollution control activities included making surveys of the physical, biological, chemical, sanitary, and radiological quality of water in all TVA reservoirs and the principal streams of the system. TVA participated in the national water quality monitoring network by collecting samples at three points on the Tennessee River. In addition, TVA participated with FWPCA and the States of the region in a comprehensive water quality management plan for the basin, which identified streams where water did not meet water quality standards and

specified the degree of treatment needed at each pollution source (74).

Furthermore, TVA conducted research on how to improve the quality of water discharged from TVA reservoirs by modifying water control structures. (It had been found that reservoir water released to augment low flows in midsummer was often in the stratum of water with low dissolved oxygen) (75.) TVA also conducted research on the waste assimilative capacity of the Tennessee River system, to permit more judicious planning of industrial development, and also on the pollutional effects of land runoff from areas with different types of soil cover (76).

TVA spokesmen explained that it helped local groups participating in its TAD program to make inventories of waste disposal and stream quality situations as a basis for plans for water and sewer facilities and waste treatment plants (77). They explained that TVA also worked with prospective industrial developers by trying to locate plants near streams with adequate capacity to assimilate wastes (78). In addition, TVA spokesmen asserted that the authority was able to abate pollution from existing industries on reservoir shorelines by reviewing the adequacy of waste treatment plans to conform with pollution control covenants in deeds (79).

Because TVA operated steam electric power plants on the shores of the Tennessee River system and was in the process of constructing and planning nuclear power plants, its research into thermal pollution of water was particularly significant. The data derived from tracing the movement of heated water discharges in the River was used in the design of cooling water discharge systems (80). The systems that would be used in TVA's first two atomic electric plants were planned to feature large underwater diffuser pipes laid across the bottom of the main channel. These pipes contained thousands of small holes so that the discharge would mix evenly with the cooler, overflowing river water (81).

In addition, TVA was involved in a long-term, FWPCA-supported, research project on the effects of thermal discharges on stream ecology. This project was used in the design of thermal water quality criteria (82).

TVA and its program had been strongly supported by the conservationist movement of the thirties. In the sixties, despite a creditable record in both shoreline land use planning and water pollution control (the two most important water-related causes of the "new conservation" movement), it was strongly criticized. This was partly because of environmentalist opposition to impoundments such as the Tellico Project. But to a

much larger extent, it was because of opposition to TVA's tremendous use of Appalachian strip-mined coal in its steam electric power program. Beginning in 1965, TVA included land reclamation provisions in all its purchase contracts for strip-mined coal. And every issue of TVA's annual report reported on its strip-mine reclamation research and demonstration projects and its efforts to secure State strip-mine reclamation legislation (83). But the opinion of the organized environmental movement was that the reclamation provisions in TVA coal purchase contracts and TVA-sponsored State legislation were totally inadequate (84).

10. THE WATER RESOURCES COUNCIL

The Structure of the Council

The Water Resources Planning Act, originally proposed in 1961, became law in July 1965. The President's ad hoc Water Resources Council (consisting of the Secretaries of Agriculture, Army, Interior, and Health, Education, and Welfare) became the statutory Water Resources Council (WRC), also known as the Council of Members. The Chairman of the Federal Power Commission was added to its membership.

The ad hoc WRC's Interdepartmental Staff Committee, which had prepared Senate Document 97 and the budget and program for interdepartmental type I and II plans,¹ became the Council of Representatives (COR)—the principal working group of the statutory council. The COR chairman, a representative of the Department of the Interior, became the Council's first executive director (1).

After the Department of Transportation Act of 1966 (2) was enacted, the Secretary of Transportation became a WRC member with respect to matters pertaining to navigation. At about the same time, the Secretaries of Commerce and HUD became associate members. They were entitled to participate in consideration of all matters relating to their water resources programs and responsibilities, except that their concurrence in Council decisions was not required. Observer status was given to the Director of the Budget and the Attorney General. In addition, heads of other Federal agencies could be invited to participate in considering matters affecting their responsibilities (3).

The cabinet-level WRC itself was directed by its regulations to meet regularly at least four times a year. In practice, it met less frequently. Only in the early days of WRC's existence, when the northeastern water crisis of 1965-66 was on its agenda, had

¹The 1962-65 achievements of the ad hoc Water Resources Council and its interdepartmental Staff Committee were discussed in chapter 2.

most of the members attended meetings. Subsequently, meetings were generally attended by the Secretary of Interior—who had been appointed WRC chairman in both the Johnson and Nixon administrations—the chairman of the Federal Power Commission, and designees of the other members. The members' designees were usually at the assistant secretary level (4).

Most of WRC's work was thus necessarily carried out through a number of other groups: (1) COR; (2) the Council's small staff; (3) technical, advisory, and field committees composed of representatives of the member agencies, and (4) special task forces with a similar interagency composition: COR actually made most WRC decisions, drew up the agenda, and made preliminary recommendations concerning decisions that the cabinet-level Council itself was required to make. COR consisted of the Executive Director and one or more representatives of each member. But each department had only one vote and all COR decisions which were not reviewed by the Council of Members had to be unanimous. COR representatives were men who held high civil service positions in the principal water agencies of the member departments. They were usually several levels below the member (and his designee) and—particularly in departments with many concerns unrelated to water resources—were seldom included among his top policy advisors (5).

WRC's Responsibilities Under the Water Resources Planning Act

WRC was charged by title I of the Planning Act to perform the following mandatory responsibilities concerning planning and policy making:

- (1) Prepare a national assessment (biennially, or less frequently, if appropriate) of regional water supply and demand (6).
- (2) Study the adequacy ("to meet the requirements of the larger regions of the Nation") of regional and river basin plans, and existing and proposed policies and programs (7).
- (3) Study the adequacy of administrative and statutory means for coordinating Federal agency water resources programs and policies (8).
- (4) Make recommendations to the President concerning Federal water resources policies and programs (9).
- (5) Establish—with presidential approval—principles, standards, and procedures for Federal participation in river basin planning and for formulation and evaluation of

water projects—whether or not they originated in river basin plans (10).

- (6) Review plans submitted by the river basin commissions created pursuant to title II and send them, together with Council recommendations, to the President. (The President was required to transmit the plans to Congress together with his own recommendation concerning their incorporation into the project authorization process (11).)

In addition, title II of the act authorized the Council to participate in the creation, operation, and termination of interstate, intergovernmental river basin planning commissions (12).

Title III authorized the Council to make financial grants to the States (over a period of 10 years) to assist them in developing and participating in comprehensive water and related land resources plans (13). Appropriations of up to \$5 million a year were authorized for the State planning grant program (14).

WRC's Mission

As Liebman points out in his report to the National Water Commission, the responsibilities given WRC by the Water Resources Planning Act had two main goals: (1) encouragement and supervision of river basin planning, and (2) preparation of comprehensive and consistent executive branch water resources policies (15).

WRC's mission also included a responsibility not explicitly given to it by the Planning Act. This was the charge, given to the ad hoc Council by President Kennedy in 1962, to develop by 1970 the nationwide comprehensive river basin plans that had been requested by the Senate Select Committee on National Water Resources. As noted in chapter 2, the ad hoc Council had already organized and made a start on a program of 12 large-region framework planning studies and 15 river basin feasibility level studies under this charge.

The way in which WRC was to exercise this responsibility was also affected by its inheritance in 1966 of the field committees of the old Interagency Committee on Water Resources (ICWR) and their ongoing planning activities. ICWR had been founded in 1954 to continue the work of a still older interagency committee, the Federal Interagency River Basin Committee. This work was to coordinate future construction programs of the Corps, Bureau of Reclamation, SCS, and the States in selected river basins. The purpose of this type of "comprehensive" river basin planning was to assure both the hydrologic coordination

of upstream and downstream water developments and the equitable distribution of the benefits of water resource development among a variety of interest-group clienteles. In addition, ICWR field committees provided a forum for criticisms and suggestions concerning proposed construction agency projects by other water resources oriented agencies. These "special interest" agencies included the Federal Power Commission, the Fish and Wildlife Service, the Public Health Service, and (before the establishment of the Bureau of Outdoor Recreation) the National Park Service (16).

When the planning responsibilities that the statutory Council inherited from the ad hoc Council and ICWR were added to the planning responsibilities given it by the Planning Act, clear mandates were spelled out for the major elements of WRC's planning program. These were (1) the national assessment, (2) the program of comprehensive plans, (3) establishment of river basin planning commissions, (4) development of principles and standards for project evaluation, (5) review of river basin plans, and (6) the State planning grants program. By contrast, the vaguer mandate in the act to study and give advice on water resources program and policy issues would require further decisions as to what program and policy issues WRC should study. These would be difficult decisions to make because most of them would affect the programs of the departments and agencies that were represented on WRC.

WRC's Planning Activities

The National Assessment

The mandate of section 102(a) of the Planning Act—to maintain a continuing study and prepare an assessment of the adequacy of water supplies to meet regional needs—was one of the first tasks the statutory council undertook. In January 1967 WRC approved a "general plan" for the national assessment, a work plan for the first assessment, and a proposed program for a "continuing" national assessment.

Because of the inadequacy of available data, and the difficulty of deciding what "regional needs" actually were, the continuing assessment was divided into three time phases. Phase I was to include the first national assessment and perhaps the next one. It would be based on readily available hydrologic, physical, and economic data with limited analyses. Phase II would build on the approach taken in phase I and would use the results of the by-then-completed type I comprehensive framework plans. It would also use a computer simulation model to arrive at probabilities of "deficiencies and excesses" in water quality and quantity for each of 200 to 300 basins.

Phase III would build on phase II by taking account of economic factors (including pricing of water), differences in productivity, institutional constraints, and other factors affecting measurement of water supply adequacy. It would incorporate an analysis of benefits and costs of existing and future water resource developments. Full implementation of phase III would depend on development of new analytical methodology. OWRR agreed to sponsor the research needed to develop such methodology (17).

The first national assessment was published in 1968 under the title, "The Nation's Water Resources." It surveyed the water supply-demand outlook for each of the 20 major U.S. water resource regions, and projected this outlook over a period of 50 years. WRC findings and recommendations were based on supporting chapters prepared by teams of representatives of member agencies, each headed by one of the departments represented on the Council or an interagency field committee (18). The data on which the assessment was based included statistics on natural runoff and water use in 1965 (supplied by the Geological Survey), other available statistics on water demand, and the experience and judgment of agency field personnel concerning trends in demand and critical water problems (19).

Projections to the year 2020 of population and economic activity throughout the Nation were taken from the recently completed first phase of the OBERS studies (20). The program was named after the agencies that made the projections: the Office of Business Economics of the Department of Commerce (OBE), and the Economic Research Service of the Department of Agriculture (ERS).²

The conclusions of the first national assessment were consistent with the findings of the report of the Senate Select Committee on National Water Resources 7 years earlier. Increases in both withdrawal and instream water uses would occur in the next 50 years, exacerbating current water shortages and problems. These findings were based on assumptions that population would continue to grow at the rate of 1.6 percent a year, that the Gross National Product would grow 4 percent annually, and that the recent tendency of economic activity to shift from the Northeast to the West and South would continue (21).

²The OBERS economic base study had been begun in 1964 (at the request of the ad hoc Council) to provide a standard set of projections that would be used by all Federal agencies in water resources planning. This study covered about 200 water resource planning areas and consisted, for each area, of two parts: (1) a historical and current picture of the economy of the area, and (2) projections of income, employment, population, and production to the years 1980, 2000, and 2020.

In the summary chapter, WRC related findings of the assessment to recommendations of actions to be taken by its member departments and the States and statements of the changes of emphasis the Council itself would take in its own planning program. These recommendations and emphases included: (1) increasing the use of comprehensive river basin planning to achieve community and regional development goals and to counter the trend to concentration in urban areas (22); (2) intergovernmental planning of major storage and conveyance works for metropolitan water supplies (23); (3) more planning for preservation of natural recreation opportunities, and (4) encouragement of nonfederal, single-purpose recreation development near cities (24). In addition, WRC stated that it would direct its planning policies toward development of a unified program of flood plain management including land use regulations, flood proofing, flood warning and flood insurance, along with flood control structures and measures (25).

The summary chapter also commented on the diseconomies involved in large increases of irrigated acreage and predicted a comparatively modest increase. In addition, it took note of doubts raised by two presidential advisory commissions concerning the usefulness of Federal assistance for cropland development in relation to national food and fiber requirements and problems of regional and national rural poverty. WRC stated that in its comprehensive framework studies, it would relate demands for irrigation and drainage to projected national food and fiber requirements and regional social and economic problems. It further stated that it intended to undertake a national study of agricultural water management policy (26).³

In addition, WRC urged—on the basis of projections that withdrawals of water for steam electric power would increase 10 times by the year 2020—that research be undertaken on the development of controls on cooling water withdrawals and discharges (27). The summary chapter also drew attention to a projected six-fold increase in waterborne tonnage and a four-fold increase in the number of pleasure craft. It recommended a long-range study (by the Department of Transportation) of the inland navigation system, including the Great Lakes and intracoastal waterways (28). In addition, WRC recommended that conventional and (especially) pumped-storage hydroelectric sites should be included in a program for reservation of reservoir sites (29).

WRC did not propose any changes in its own comprehensive planning program to deal with water quality problems, but it

³In actuality, WRC did not undertake any agricultural water management policy studies during this period.

pointed out that both the new water quality standards and ongoing cooperative intergovernmental planning under the Federal Water Pollution Control Act were organized to deal with this task. WRC urged vigorous pursuit of ongoing Federal, State, and local water pollution control programs, including "adequate pollution abatement investment." It also stated that emphasis should be placed on water quality management on the river basin level and that a system of benefit-cost analysis applicable to water quality measures should be developed (30).

The summary chapter of the first assessment also recommended that PHS's National Drinking Water Standards be revised to provide for recently identified toxic substances (31), and that watershed management programs place increasing emphasis on protecting streams from siltation, especially in watersheds that were in the process of changing from agricultural to urban use (32). WRC also took note of the rapid rate of population growth close to beaches, estuaries, lakeshores, and riverbanks and asserted that this phenomenon pointed up the need for an expanded intergovernmental program of shore and riverbank protection (33). In addition, WRC recommended that wetlands be appraised for their preservation values before being drained for agricultural or urban uses (34) and gave its support to member agencies' ongoing studies to identify areas of stream for preservation (35).

The regional assessments in chapter 6, which reported the current and prospective water problems of the regions, appeared more conservative than the summary chapter. The assessments proposed solutions that included the proposed construction programs of the Corps, SCS, and Bureau of Reclamation, to which they added additional waste treatment, cooperative intergovernmental solution of institutional problems, and—in some regions—new technology to augment water supplies. In most regions, flood plain management (as a supplement to already authorized or planned flood control structures) was identified either as the solution to an "emerging problem" or as a projected need of the year 1980 (36).

Relations with the River Basin Commissions

Title II of the Water Resources Planning Act provided that the President could establish a river basin commission upon written request of the Council or a State, with concurrence of the Council. Concurrence of one-half the States of the basin was also required, except in the Columbia or Upper Colorado basins, where concurrence of three-fourths of the States was required (37). In practice it was WRC policy during this period to have a State rather than the Council make the initial request for a commission and to wait until all States in the basin joined

in that request before recommending to the President that he establish such a commission (38). Only four river basin commissions were established in this period, all in 1967: the Pacific Northwest, Great Lakes, Souris-Red-Rainy, and New England river basin commissions (39). But initial requests were made concerning several other river basin commissions, and it was expected that some of these would be established in the next few years (40).

The river basin commissions were planning agencies with no authority to construct or operate projects, regulate river flow, or manage either water supplies, shoreline land use, or sewage systems. They were composed of (1) a presidentially-appointed chairman who also served as coordinating officer of Federal members; (2) one member from each Federal department or independent agency with a substantial interest in the work of the commission; (3) one member from each State in the basin; (4) one member from each interstate compact agency with jurisdiction in the basin; and (5) at the discretion of the President, one member of any international treaty organization with jurisdiction in the basin (41). Half the commission's total administrative expenses were paid by WRC (42).

The Planning Act provided that the duties of a river basin commission were:

- (1) To serve as the principal coordinating agency in the basin for plans of all levels of government for water and related land resources development.
- (2) To prepare and keep up to date a comprehensive joint plan for Federal, State, and local development of the water and related land resources of the basin.⁴ This plan was required to include an evaluation of alternative means of achieving optimum development.
- (3) To recommend priorities for data collection, investigations, planning, and construction of projects.
- (4) To foster and undertake all studies necessary to prepare its comprehensive plan.
- (5) To submit to WRC, together with the comprehensive plan, recommendations for keeping the plan up to date and for implementing it (43).

None of the four river basin commissions established in 1967 came near to completing its own comprehensive joint plan in this period. But by 1970, each of them had published at least one priority report assessing the urgency of Federal and State

⁴The Planning Act directed each commission to make every effort to arrive at its plan by consensus of the members on all issues. Differing views were required to be reported, however. If because of absence of consensus, no course of action was agreed on, the positions of the chairman, acting for the Federal members, and the vice-chairman, acting for the State members, were to be fully reported.

water resources programs in the basin, under WRC guidelines (44).

In addition, the Pacific-Northwest, Great Lakes, and Souris-Red-Rainy basins commissions were given responsibility for Council-sponsored, regional framework or type I plans, which would also serve as the first stage of their own plans (45). The Pacific-Northwest River basin commission also led WRC's type II studies in its region (which had been previously led by the discontinued Columbia basin interagency committee) (46). In the Great Lakes basin, type II studies continued to be led by the Corps, but the commission participated in them and incorporated them into its own plan (47).

The New England river basin commission (NERBC) was not given responsibility for either the ongoing North Atlantic Region framework study (which had been separately authorized to be undertaken by a Corps-led coordinating committee under WRC supervision) or the ongoing Connecticut River basin type II study. It sought to participate in and influence these WRC-sponsored studies, however (48).

NERBC also undertook—in cooperation with Federal agencies, the States and local governments—a number of special projects of particular interest to the State members of the Commission. Many of these had a decidedly environmentalist cast. They included a small dam safety study, a flood plain management study, a report on State power plant siting laws, coordination of the water pollution abatement program that was being prepared to comply with the Boston Harbor Federal Enforcement Conference, and coordination of the activities of a New England States' pesticide study committee (49). In addition, NERBC obtained funding from the New England Regional Commission, a regional economic development commission authorized by the Public Works and Economic Development Act of 1965, to conduct (1) a coastal zone management study and (2) the Nashua River demonstration project of intergovernmental water pollution control on an entire river basin (50).

At the end of the decade, NERBC was preparing to pioneer a new method (and kind) of multiple-purpose river basin planning. The Federal share of all WRC type I and II plans had been financed by appropriations to participant agencies. NERBC did not challenge this system with respect to the ongoing studies that were initiated before it was established, but favored central funding of the future river basin plans that would be conducted under its own supervision (51). In 1969, NERBC succeeded in getting fiscal 1970 appropriations for initiation of two new type II studies made directly to WRC for transfer to the Commission. But these studies, the Southeastern

New England study and the Long Island Sound study, were not begun until fiscal 1971 (52). It was expected that most of the concerns these studies would deal with would involve problems (such as water quality, shoreline management, beach environments, and tidal floods) that could not be solved by traditional Federal reservoir and channel improvement projects (53).

The Comprehensive Studies—Type I and II Plans

Chapter 2 discussed the creation, by the *ad hoc* Water Resources Council in 1963-64, of a program of interagency, intergovernmental plans. This program, which was intended to carry out the Senate select committee's recommendation that the executive branch prepare comprehensive plans for all major river basins by 1970, barely got underway before the statutory Council, which inherited it, was created. It mainly consisted of type I framework plans and type II feasibility level plans. WRC expected to prepare type I plans for all 18 of the major water resources regions of the contiguous United States. Type II plans were to be prepared initially for the 15 river basins for which Congress had already authorized Corps of Engineers basin level planning.⁵

It was intended that when the river basin commissions authorized by the Planning Act came into existence, they would assume responsibility for these studies. In the interim, the *ad hoc* Council decided to use two other organizational mechanisms for conducting the studies. These were also inherited by the statutory Council. Framework studies were to be conducted by the ICWR's regional interagency committees—which had State as well as Federal members—where these committees were operating. Where there were no regional committees, framework studies were to be conducted by *ad hoc* coordinating committees of Federal agency and State representatives, led by the Corps of Engineers (54).⁶ When the first river basin commissions were established, they were given planning responsibilities similar to ICWR regional committees. But they were not permitted to replace the *ad hoc* coordinating committees on planning efforts authorized to be led by the Corps (55).

⁵This program was also supposed to include type III single project or single purpose studies and type IV State surveys in cooperation with Federal agencies, even though they were not to be reviewed by the Council. It was hoped that all such studies (as well as type II studies) would eventually be based on recommendations in framework plans.

⁶An already noted exception to this rule was the North Atlantic regional framework. The NAR plan was assigned to a Corps-led *ad hoc* coordinating committee, even though part of the region was in the jurisdiction of the New York-New England Interagency Committee. This was because the plan had been separately authorized by statute to be carried out by the Corps under Council supervision.

The ad hoc Council also originated the method of funding comprehensive studies used by the statutory Council until the last year of the period. This provided that the coordinating group conducting the study would initially decide (based on inputs from each agency) how much funding would be needed by each participating Federal agency. The Council would review and probably revise the proposed budget for the study and send it to the Bureau of the Budget. BOB would then review the Council proposal and use it in making the planning budget requests of participating departments and agencies (56).

The comprehensive studies have already been discussed in chapters 5-8 in terms of the participation in these studies of the Corps, Bureau of Reclamation, SCS, and FWPCA, respectively. The apparent significance of this participation for the future programs of those agencies has also been discussed. But it seems appropriate to make some observations about the apparent significance of these studies to the Federal water development program as a whole.

Type I studies consisted of the following:

- (1) The OBERS projections of regional economic development to the years 1980, 2000, and 2020;
- (2) Translations of these projections into demands or needs for water and related land uses;
- (3) Hydrologic projections of the quantity and quality of available water;
- (4) Translation of items (1), (2), and (3) into projected water and land resource problems; and
- (5) "General approaches" that appeared appropriate for the solution of such problems (57).

By the end of 1970, one of the framework studies, the Ohio River basin plan, had been reviewed by WRC and was ready to be sent to Congress. Eight others, the Columbia-North Pacific, California Region, Great Basin, Lower Colorado, Upper Colorado, Missouri River Basin, North Atlantic Region, and Upper Mississippi River Basin, were either essentially complete (but still in need of review by States, Federal agencies, and WRC) or were nearing this point. Four framework studies were in mid-process and seven still had to be initiated if the original goal of preparing frameworks for the entire Nation was to be accomplished (58).

The various type I studies achieved rather different results. The Ohio Basin plan, for instance, emphasized the solution of present and 1980 needs by traditional Federal and State construction programs supplemented by flood plain management, mine drainage control, and identification of esthetic sites for preservation (59). The North Atlantic Region (NAR) study took an entirely different approach. The NAR plan

estimated needs for each area on the basis of three objectives—regional development, national income, and environmental quality. The plan determined that the environmental quality objective was most important in most areas and drew up a mixed objective plan for each area. Pollution abatement measures of various kinds, preservation, and land management measures were the principal recommended solutions (60).

Each of the type II studies also included a framework plan for its own basin, because no regional frameworks were completed until the end of this period. In addition, type II studies included planning in sufficient detail, including plan formulation, to serve as a basis for authorization of projects that should be initiated in the next 10 to 15 years (61).

What this additional planning would mean in terms of future construction and operating programs appeared to vary according to the program involved. Congressional committees responsible for Corps of Engineers and (especially) Bureau of Reclamation authorizing legislation were accustomed to responding to requests for authorization of entire river basin plans. Thus, for example, the Corps projects in the Sabine River basin type II plan were authorized in the Flood Control Act of 1970 very shortly after the plan was completed and approved by the Council (62). As we have seen in chapter 5, authorization of Corps projects did not necessarily mean that money would soon, or ever, be appropriated to construct them. But since Federal agencies prepared projected construction schedules 5 years in advance, and made their budget requests in accord with central executive branch policies, it appeared likely that type II plans would accelerate the tendency for individual projects to arise from river basin plans.

The type II studies also identified small watershed projects for initiation in the next 10 to 15 years. But it was more difficult to predict the part these projects would play in the small watershed program. This was because, except perhaps in Appalachia, there was little precedent for using the project initiation process under P.L. 566 to translate river basin plans into construction programs. Watershed project applications had customarily been assigned planning priority by State conservation committees and approved for operations by the responsible congressional committees, based on local needs and readiness to cooperate, rather than on the basis of inclusion in river basin plans. Moreover, it was the expectation of both the concerned congressional committees and the executive branch that all projects approved for operations in this program would be funded as soon as budgetary considerations permitted.

Although FWPCA representatives participated in all type II plans, no attempt was made to draw up any kind of plans for

the waste treatment projects that they found necessary. This was probably because FWPCA planners had no experience with "implementation" planning. Federal planning under the Water Pollution Control Act had always been a kind of framework planning. In addition, the Pollution Control Act provided for Federal support of State comprehensive water pollution control planning and for FWPCA reliance on State plans and State assignments of project priority in awarding financial assistance for treatment projects. Thus, there appeared to be little prospect that WRC-sponsored plans would exert much influence on the national treatment plant construction effort. Type II plans did provide for water quality storage in reservoirs, however. Type II plans also included detailed plans for State and local water supply and recreation facilities and recommendations for land acquisition for recreation and fish and wildlife through various Federal and State programs. They also included recommendations of preservation of specific stream reaches for scenery and fish and wildlife—sometimes as part of State and Federal wild and scenic river systems.

With respect to flood plain management, the first batch of type II plans submitted to the Council in 1968 made only the general recommendation that States and localities make use of the Corps flood plain information studies as a supplement to the specific flood control measures and land treatment programs included in the plan. These were plans for mainly rural areas (63). But the type II studies that were not completed until 1970 or 1971 made more detailed recommendations. They recommended flood plain information studies, preparation of flood plain management programs, and flood plain zoning for specific areas. They also recommended such other land use regulation measures as passage of State land use or coastal zone use legislation and creation of basin-wide wild and scenic rivers programs (64).

Of the original type II studies begun during 1963-64, 7 had been completed and 8 were nearing completion at the end of 1970 (65). In addition, appropriations had been made for three others, although they were not started in this period. In the case of the two studies to be conducted by the New England River Basin Commission, appropriations were made to WRC, rather than the participating agencies (66).

The WRC Director was to testify in early 1971 that \$48 million had been spent on type I and \$40 million on type II studies (67).

The New Planning Policy—Level A and B Plans

Shortly after the appointment of the second WRC Director in early 1970, the Council staff began to reevaluate the

organization of its comprehensive planning programs. In July 1970, the Council issued a policy statement (68) changing the format of the comprehensive studies and explaining that the objectives of the "new policy" were to:

- (1) Establish levels instead of types of planning, and to clearly interrelate the levels.
- (2) Upgrade Federal-State-local coordination and communication.
- (3) Strengthen study management by centralization.

The policy statement said that the goal of comprehensive planning was to provide guidance for water resources conservation, development, and use to all levels of government—Federal, State, and local—as well as joint intergovernmental plans. To achieve these objectives, it was clear that it would be necessary to consider all reasonable alternative water uses in terms of the four planning objectives developed by the special task force. (These four objectives—environment, national economic development, regional development, and quality of life—will be discussed later in this chapter.) It would also be necessary to obtain the participation of Federal, State, local, and private interests from the beginning of the study, to identify all alternative courses of action and the needs and desires of the people (69).⁷ The plan itself would be expected to identify the level of government and agency that would be responsible for implementing each separate aspect of the plan and show how each such aspect related to the whole.

Under the new policy, planning would be divided into three levels. Level A would combine the former type I studies with the national assessment process—which had covered much the same ground. Henceforth, the continuing national assessment (which would now be reported every 5 years) would provide the basic appraisal of overall regional needs. Completed type I studies would be brought up to date by OBERS projections. In regions where type I framework studies had not been started, regional assessments or smaller scale framework studies, as needed, could be substituted.⁸

⁷All type I studies and many type II studies were conducted by Federal-State teams with relatively little input from local government or the public. However, in such type II studies as the Grand River basin, Puget Sound, and Connecticut River basins, public hearings held to elicit public reaction to preliminary plans uncovered substantial opposition (mainly environmentalist) to planning recommendations and alternatives. On the other hand, in the Susquehanna River basin study, the steps taken to elicit public preferences in deciding among alternatives resulted in producing a locally supported plan (discussed in chapter 5).

⁸In practice, this resulted in the national assessment substituting for framework studies in areas where the latter had not yet been initiated. No new framework studies were initiated after the July 1970 policy statement.

Level B plans would be regional or river basin reconnaissance level plans that would not provide sufficient detail for future authorization of projects. They would only be undertaken as needed. That is, they would only be undertaken in areas where framework plans or the national assessment showed the existence of complex long-range water and related land resource problems that should be solved before individual project or program plans were considered.

Level B plans would also differ from the old type II plans in that they would not necessarily be prepared for hydrologic river basins. Instead, they could be prepared for whatever geographic area seemed appropriate for dealing with the problems under consideration, including political units, economic regions, or demographically significant areas. Level B plans would also include State comprehensive plans prepared cooperatively with Federal agencies. Level B plans were expected to be completed within 3 years of their inception.

It was also expected that level B plans would contain recommendations for level C or "implementation" plans to be prepared by individual Federal, State, or local agencies for project authorization or program development. Level C plans would not be prepared under WRC supervision. They were nonetheless expected to be formulated on the basis of the same multiple objectives used in level A and level B plans. They were also expected to make recommendations that would "encompass the broad spectrum from preservation to full development" and lead to structural and/or nonstructural solutions to problems (including institutional solutions).

The new planning policy also provided that henceforth all level A and B studies would be chaired by individual leaders appointed by the Council or river basin commissions, rather than agency-led coordinating committees or regional interagency committees.

Other Planning Studies

In general, WRC's participation in planning studies was limited to supervision of its own program of framework and river basin plans. But, in addition, WRC also reviewed or otherwise contributed to a number of other planning efforts impinging on its own planning studies.

Thus, in early 1967, WRC established relations with the National Council on Marine Resources and Engineering Development to make arrangements for coordination of overlapping aspects of the comprehensive studies and the studies of the Marine Council. The report of the Marine council's committee on multiple uses of the coastal zone was reviewed by a WRC task force in 1969 (70).

WRC also commented on the national estuarine pollution study of the Federal Water Pollution Control Administration (71).

In addition, after the passage of the Wild and Scenic Rivers Act of 1968 (72), WRC began to review implementation reports of the Departments of Agriculture and Interior on proposals for authorization of wild and scenic rivers (73).

The Western U.S. water plan (Westwide study) that was authorized in the Colorado River Basin Project Act of 1968 and begun in 1970 was discussed in chapter 6. This study assigned responsibility to the Department of the Interior (rather than WRC) to prepare a reconnaissance level plan to meet the current and future water supply needs of the 11 contiguous westernmost States. It appeared to duplicate much of the subject matter of the type I and II studies. However, the leaders of the Westwide study decided that they would not duplicate data collection efforts but would incorporate the information in the comprehensive studies (especially the OBERS projections) into their own study (74).

Development of Evaluation Principles and Standards— Recommendations of the Special Task Force

Section 103 of the Water Resources Planning Act gave WRC the responsibility for establishing the “principles, standards, and procedures” that would be used by the three principal construction agencies to provide the required economic justification for water resources projects in both individual project reports and river basin plans.

The earlier history of the use of economic justification by benefit-cost analysis is described in considerable detail in the first volume of this study (75). It seems appropriate to briefly recapitulate this earlier history before discussing the new concepts of benefit-cost analysis that were recommended by WRC’s special task force.

Benefit-cost analysis originated in the provision of the Flood Control Act of 1936 that the Federal Government could participate in flood control improvements “if the benefits to whomsoever they may accrue are in excess of the estimated cost.” This requirement was subsequently extended to other kinds of water resources projects and its interpretation resulted in the development of various analytical procedures.

By the beginning of the 1950’s, economic justification procedures relied almost entirely on “national economic efficiency,” that is, on a favorable ratio of benefits to costs. A favorable benefit-cost ratio showed that the estimated direct gains to the national economy from each project, and each purpose used to justify the project, would exceed its costs.

Bureau of Reclamation procedures also provided for computation of the indirect or "secondary" economic gains stimulated by the project, which generally occurred in the vicinity of the project. In addition, reports of all the agencies sometimes included word descriptions of "intangible benefits" that could not be translated into monetary terms. These included saving lives and improving well-being through flood control, scenery, wildlife, and (until procedures for assigning monetary values to it were devised in the early 1960's) recreation.

During the New Deal, executive branch policies had favored greater reliance on secondary and intangible benefits, which were thought to embody the social reasons for which water resources projects were wanted. But executive branch policy changed after the end of the depression and wartime periods, and the Bureau of the Budget would no longer permit secondary and intangible benefits to be used to justify projects.

In 1962, the ad hoc Council established a new set of directives for formulation and evaluation of water resources projects and river basin plans at the request of President Kennedy, who in turn was responding to the expressed desires of Congress for less restrictive project evaluation standards. These directives, known as Senate Document 97, are summarized in more detail in chapter 2. They were the basis for project reports for all Corps and Bureau of Reclamation projects authorized or started, and all SCS projects "approved for operations" during this period. They were not considered applicable, however, to FWPCA-assisted sewage treatment projects or HUD- and FmHA-assisted water and sewer facility projects.

Senate Document 97 was said to have "liberalized" project justification procedures because it stated that national and regional economic development, preservation, and well-being of people, were all legitimate water resources planning objectives. Senate Document 97 required all project formulation reports to fully describe secondary and intangible benefits. But a favorable benefit-cost ratio, based on tangible benefits and costs only, was still required for project justification. Secondary benefits could be included in the benefit-cost ratio only on the difficult proof that they were national (not merely regional or local) benefits which would not accrue elsewhere if the project was not built.

There were, however, beginning in the second half of the sixties, several experiments on the river basin planning level (not on the project authorization level) in what came to be known as multiple-objective planning. This concept probably had its origins in ideas expressed in the Harvard water program of the late 1950's by such scholars as Marglin and Maass. It required making quantitative measures of benefits and costs of

water development—not only to economic efficiency but to other water development objectives, such as redistribution of income or environmental quality. Tradeoffs could then be made between objectives, and an optimum plan could be selected, based on whatever weighting of objectives was considered to be in the public interest (76).

The principal multiple-objective planning experiments that were carried out or begun in the 1960's were all conducted by interagency planning groups led by the Corps of Engineers. They were the Appalachian water resources survey (required by law to be conducted for the objective of regional economic development) and two comprehensive studies led by the Corps North Atlantic Division: the NAR type I, and the Susquehanna River basin type II study. Both the NAR study and the Susquehanna study recommended programs that emphasized waste treatment and land management measures on the basis of benefits and costs to environmental quality, rather than dams and channel improvements. All three of these planning efforts are discussed in more detail in chapter 5.

In early 1968, President Johnson directed WRC to develop “a more appropriate” discount rate (for use in computing future benefits from water projects) than the 3¼-percent “coupon rate” used under Senate Document 97. The probability that the discount rate would now rise very markedly alarmed several congressional committees. They believed that this would cause many worthy projects to be eliminated that deserved to be built because of regional economic development and other secondary benefits (77).

In late 1968, WRC acceded to the requests of these congressional committees that it review and, if necessary, revise Senate Document 97 to assure that project formulation and evaluation procedures give adequate weight to all project benefits. WRC appointed a special task force composed of representatives of the Departments of Agriculture, Army, and Interior to accomplish this purpose.

After a first public hearing in January 1969, the task force proceeded to prepare an initial report on multiple-objective planning methods which was published in June 1969 and widely publicized. Nine public hearings were held in the field and in Washington. Tests of recommended planning methods were made on 10 projects. On the basis of these hearings and tests, the special task force revised its original report and submitted its final report to WRC in July 1970. This report included (1) findings and recommendations, (2) principles, and (3) standards (78).

The special task force recommended that water resource planning be based on four objectives: national economic

development, environmental quality, regional economic development, and social well-being (79).⁹ The task force recommended that each of these objectives be given equal consideration. The national economic development objective, which had been the subject of the traditional benefit-cost ratio, should no longer necessarily be the primary basis for plan formulation. Plans that were explicitly formulated to emphasize other planning objectives should be given higher priority if this was called for by national policies and the desires of the people of the planning area.

The task force recommended that all water resources plans be justified by a system of multiple-objective accounts, expressed whenever possible in quantitative but not necessarily monetary measures.¹⁰ These accounts would show the estimated beneficial and adverse effects on each objective of each planning alternative. They would have to be prepared in the form of alternatives for each component or project in order to maximize the opportunity to compare the advantages and disadvantages of each approach. The "best plan" would then be selected and recommended by the planning organization on the basis of an evaluation of the tradeoffs among the various objectives.

The task force pointed out that effective multiple-objective planning would require consideration of many alternative courses of action, involving all types of structural and management measures. These alternatives could be carried out by Federal, State, local, and private interests—not merely the programs available to the Corps, the Bureau of Reclamation, and SCS. Although the task force could only recommend that its principles and standards be used by Federal water planners, it apparently hoped to set up a conceptual framework that State planners would also use (80). However, although water quality management measures were definitely among the alternatives that must be considered by multiple-objective planners, it was apparently not considered that multiple-objective planning (or the plans in which it was used) would be used by planners of waste treatment facilities or water and sewer facilities.

The task force's report was not acted on in this period. Its own recommendations were that the proposed evaluation principles be published in the Federal Register for comment. They

⁹The social well-being category, also known as "quality of life," was not so much a single objective as a catchall that included several concerns. These concerns had been identified by such social scientists as Maass, or by political supporters of water development as the major reasons why water development was wanted in the first place. They included equitable distribution of income and employment; population dispersal; security of life, health, and property; public recreation; and national self-sufficiency.

¹⁰Such as acres of land, miles of stream, numbers of jobs, or recreation days.

could then be the subject of additional public hearings and be reviewed and amended before submission for scrutiny by the Office of Management and Budget and approval of the President (81).¹¹ However, a statement of congressional policy in the Flood Control Act of 1970 made it likely that some variant of the task force's recommendations would be implemented. Section 209 of that act said that it was the intent of Congress that the four objectives identified by the task force "be included in federally-financed water resources projects, and in the evaluation of benefits and costs attributable thereto, giving due consideration to the most feasible alternative means of accomplishing these objectives" (82).

The Discount Rate

In December 1968, WRC announced a change in the formula for deriving the interest rate used in discounting future benefits of water resources projects. The effects of this change have been discussed in chapters 5 and 6 and at various other points in this history. It was one of several important events of the last years of this period that appeared to militate against future construction of marginal projects, such as large irrigation projects or projects with benefits accumulating slowly over a long period of years, such as new navigation canals.

Two observations about the new discount rate probably should be repeated here. One is that the new rate was not initiated by WRC, but was a response to a direct presidential instruction that WRC devise a "more realistic" rate. The second is that the change in the formula had an immediate effect, not only on river basin plans and preauthorization project formulation, but on the construction of projects authorized many years before, but whose scheduling for construction had been delayed by Vietnam conflict budgetary considerations. Future benefits of projects that were started in fiscal 1968, the last year that the coupon rate formula was used, had been discounted at 3¼ percent. The discount rate was then raised to 4⅝ percent for fiscal 1969, with the prospect of another ¼-percent increase in each of the next several years. Some of the projects that were proposed for fiscal 1971 starts had originally been formulated at the 1950's rate of 2½ percent. They would now be required to achieve a favorable benefit-cost ratio in the face of a discount rate of 5⅞ percent.

But despite the shock of the December 1968 change in the discount rate formula, there appeared to be a prospect that a newer formula might be adopted which would result in an even higher discount rate, unless Congress intervened. By 1970, it

¹¹The successor agency to the Bureau of the Budget.

was apparent that the Office of Management and Budget (OMB) believed—and was supported in its belief by an influential sector of the economics profession—that a meaningful discount rate must be based on the opportunity cost of capital or, at least, the opportunity cost of Federal money. This was estimated to be between 7 and 10 percent at this time. OMB believed that a discount rate less than the opportunity cost of other Federal investments would unfairly bias Federal investment policies in favor of water projects and against other legitimate objects of Government concern (83).

For this reason, it appeared unlikely that OMB would be willing to accept the discount rate recommendations in the July 1970 submission of the special task force on evaluation procedures. These recommendations appeared to be intended (as the formula adopted in December 1968 had also been) to effect a compromise between the opportunity cost rate wanted by OMB and the coupon rate wanted by congressional proponents of water development (84). The task force recommendations stated that the discount rate should “reflect the value placed by society on benefits and costs in the future, as compared with present benefits and costs.” (This was a concept that would require further clarification in the detailed “procedures” that the task force recommended be subsequently issued by WRC.)

The task force further recommended that changes in the discount rate be made infrequently, unlike the frequent changes under the formula then in effect. It recommended that the initial rate on adoption of the principles and standards be 5½ percent (85).

Grants to the States

Title III of the Water Resources Planning Act gave WRC responsibility for administering a 10-year program of comprehensive planning grants to the States and authorized \$5 million a year to be appropriated for it. Appropriations for this program, like those for other water resources programs, were lower than the statutory authorizations. The first appropriation in fiscal 1967 was only \$1.75 million. This increased gradually to \$2.375 million in fiscal 1970 (86).

The act provided that allotments were to be made to the States on the basis of population, land area, need for comprehensive water and related land resources planning, and financial need (87). Each State was required to submit a comprehensive water resources planning program to WRC. State comprehensive planning programs were required to be coordinated with any other Statewide development planning—specifically including planning that was assisted by Federal grants under section 701 of the Housing Act of 1954 or under the Land and

Water Conservation Fund Act of 1965. There was, however, no specific requirement for coordinating State water resources planning programs with State water pollution control plans. WRC was authorized to make grants of up to 50 percent of the cost of carrying out approved State comprehensive planning programs, including the cost of training personnel (88).

Before setting up the program in 1966, WRC made inquiries of the States. These inquiries revealed that as of fiscal 1965, 17 States and the District of Columbia were either doing no water resources planning or were spending less than \$6,000 a year on such planning. Only 6 States—California, Indiana, Louisiana, New York, Oregon and Texas—spent \$400,000 or more in fiscal 1965. The leader was California, which spent \$7.5 million on water resources planning that year (89).

In 1967, the first year of the grant program, all but six States and the Virgin Islands applied for a grant. At the end of 1970, all 50 States, Puerto Rico, and the District of Columbia were participating in the grant program. The Virgin Islands was the only eligible government unit that was not (90).

In setting up the State grant program, the Council decided to use State expenditures for water and related land resources planning in FY 1965 as a base and to make Federal grants for up to 50 percent of augmented State expenditures above this base. The Council put its strongest emphasis on helping States build planning capability. For this reason, WRC used a grant formula that gave proportionately more money to States if money was spent on their own planning staffs than if it was spent on one-shot planning efforts by consultants (91).

This policy, as Liebman points out, contributed to a very vigorous growth in State water resources planning staffs, activities, and expenditures, particularly in States that had not been among the leaders in these respects before 1967. Thus Idaho, a State that had spent virtually nothing on water resources planning in 1965, had by fiscal 1971 built up a professional planning staff of 16 persons, all of whom were engaged in activities partly funded by Federal grant funds, and had committed \$574,000 of its own money to water resources planning. Idaho was actively participating in the work of the Pacific Northwest river basins commission and the Columbia-North Pacific and Great Basin framework studies at this time (92).¹² The increase in water resources spending by all the States in fiscal 1971 was two and one-half times as much as (or nearly \$17 million more than) they had spent in the base year 1965 (93).

¹²It seems probable that Idaho would have prepared its State water plan, in any event, to forestall proposals to export Columbia basin water to the Colorado basin.

Federally-assisted State water resources planning under title III included participation in river basin commissions, Council-sponsored comprehensive plans, and intrastate plans (which in turn included both water development- and shoreline management-oriented plans). States also received Federal grants for planning water resources use from a number of other Federal grant programs, especially HUD's more generously funded "701" urban planning program.

In 1969, the Governor of Ohio applied for a grant of over \$2 million in 701 funds to be spent over a 3-year period. This application was for areas of water-related planning normally funded by both HUD and six other agencies: the Bureau of Outdoor Recreation, FWPCA, EDA, FmHA, HEW's Bureau of Solid Waste Management, and WRC.

The Secretary of HUD transmitted Ohio's application to WRC—which was charged by title III with responsibility to coordinate its State grant program with related Federal planning assistance programs. A consolidated application was developed after discussion between WRC staff and the Ohio Department of Natural Resources, submitted to the Council, and approved by its members (94).

WRC, at the end of this period, was very enthusiastic about the consolidated grant application concept. It proposed to make these applications available to all States as a means of coordinating related planning for water resource development, pollution abatement, and shoreline use regulation (95).

WRC's Policy and Program Activities

Most of the responsibilities exercised by WRC in this period concerned planning. But section 102(b) of the Planning Act also charged WRC to: (1) appraise the adequacy of administrative and statutory means for the coordination of Federal water resources agency policies and programs, (2) appraise the adequacy of existing and proposed policies and programs with respect to the requirements of the larger regions of the Nation, and (3) make recommendations to the President regarding Federal policies and programs.

Leibman's examination of WRC activities shows that it undertook its planning activities on its own initiative. However, he points out that in almost all cases, WRC undertook program and policy appraisal and advice activities only when requested by the Bureau of the Budget or one of the member Departments. Thus, most of the work performed by the COR and the WRC staff in tackling such issues as cost sharing; combined water

resources development program, planning, and budgeting systems; and flood plain management and flood hazard identification, was done in response to requests from BOB. The study of controversial issues concerning the Ramparts project was performed at the request of the Secretary of Interior. Help was given to HUD in developing criteria for the flood insurance program, established by title XII of the Housing and Urban Development Act of 1968, in response to the request of the Secretary of HUD (96).

The 1968 revision of the discount rate can also be viewed as an example of a WRC appraisal of an important construction agency policy. Like other policy appraisals, it was undertaken reluctantly. In this case, at the request of the President himself.

In addition, WRC commented on a number of bills which BOB or congressional committees sent to it for comment. But there were many other issues with obvious impact on "the water requirements of the larger regions of the Nation" which WRC did not study, although it had a clear statutory mandate to do so.

Liebman asserts that the main reasons WRC became so heavily involved in planning activities while avoiding policy and program issues was inherent in the interagency committee nature of the COR (WRC's principal decisionmaking body). All the agencies represented on the COR stood to gain from improvements in planning, but some or all of them might lose a great deal by the resolution of policy disputes. Objective studies of controversial issues might result in findings that would undercut some of the programs or projects of the agencies (97).

Then too, Congress, in late 1968, created an independent National Water Commission to study and report (in 1973) on virtually all water problems, programs, and policies. Executive branch need for WRC's advice on matters other than planning was probably perceived to have declined by early 1970 when the National Water Commission staff and consultants had begun work on more than 60 background studies covering 22 subject areas.

Flood Damage Reduction

WRC's most important policy studies and recommendations (with the possible exception of its work on the discount rate) were those that concerned flood damage reduction by non-structural means. WRC worked on a number of studies for this purpose during 1966-70. Most of these originated in the recommendations of House Document 465, the influential 1966 report of the presidential Task Force on Flood Control Policy (98).

Recommendation 2 of House Document 465 was that WRC should establish a panel of hydrologists, statisticians, and economists to examine methods of flood frequency analysis. Such a panel should develop a set of the best available techniques for such analysis on the basis of known hydrological and statistical procedures. The Bureau of the Budget requested that WRC undertake this activity, which it did in September 1966 through its hydrology committee (99). The hydrology committee reported in October 1967. In December 1967, WRC published its report under the title, "A Uniform Technique for Determining Flood Flow Frequencies."

Another of WRC's flood damage reduction study activities was based on recommendations 5, 6, and 8. Recommendation 5 was that WRC should establish uniform criteria for interpreting and applying flood hazard information and should encourage State agencies to undertake responsibility for flood plain regulation and coordination of flood plain planning. Recommendation 6 was that Federal agencies responsible for assistance to housing, land acquisition, land planning, and land development should use these assistance programs to ensure that State and local land planners take proper account of flood hazards. Recommendation 8 was that an Executive order should direct all Federal agencies to take account of flood hazard in locating new Federal installations and disposing of Federal land.

In August 1966, on the same day that he transmitted the flood control task force report to Congress, the President issued Executive Order 11296 to implement recommendations 5, 6, and 8. Executive Order 11296 was directed to Federal agencies responsible for (1) construction and operation of Federal facilities, (2) administration of Federal grant, loan or mortgage insurance programs involving construction, (3) disposal of Federal lands or properties, and (4) programs entailing land use planning. All such Federal agencies were instructed to evaluate flood hazards, take steps to limit land use in proportion to the degree of flood hazard involved, and "preclude" the uneconomic, hazardous, or unnecessary use of flood plains (100).

In May 1968, BOB sent WRC a draft copy of proposed governmentwide guidelines for implementing Executive Order 11296, prepared by an interagency working group, with a request that WRC undertake a detailed revision of technical aspects of the guidelines. The WRC planning committee appointed a special task force of representatives from the Geological Survey, TVA, Corps of Engineers, and HUD (101). The WRC task force prepared a new set of guidelines in September 1969 under the title, "Proposed Flood Hazard Evaluation Guidelines for Federal Executive Agencies." The proposed guidelines were sent to

selected Federal agencies for review by experimental use, with the request that reviewers report their results to WRC by April 1, 1970. The guidelines were also sent to the States and to expert consultants for review and advice. In 1970, WRC was engaged in making a final revision of the guidelines on the basis of the reviewers' reports (102).

House Document 465 had also expressed concern that proposed legislation for an effective national program for flood insurance include incentives for flood plain management (103). The National Flood Insurance Act of 1968 conditioned availability of flood insurance on community adoption (by June 30, 1970) of flood plain management measures consistent with HUD criteria (104). In addition, section 1302(c) of the act required preparation of a unified national program for flood plain management, within 2 years of the implementation of the flood insurance program, including proposals for cost sharing among beneficiaries of flood protection (105). In October 1968, the Budget Bureau asked WRC to perform this task for the President.

WRC's report placed more reliance on nonstructural flood control measures than had been done in the past. It urged uniformity in the policies governing the programs of different agencies and development of realistic cost-sharing policies for beneficiaries of flood control structures. But 2 years later, WRC had not yet reached agreement on basic policy issues (106).

A less controversial flood damage reduction policy study, which WRC undertook on its own initiative, concerned State and local flood plain regulation. In 1968, WRC, together with five other Federal agencies and the University of Wisconsin, began a study of State and local regulation of land use in flood plains. This study assembled and summarized existing State statutes and city and county ordinances. Then, on the basis of statutory and case law, it proposed a model State enabling act to authorize local governments to adopt ordinances to regulate the use and occupancy of land in flood plains. Model local ordinances for both urban and rural lands were also included. In February 1970, a draft of the study report was distributed to all States and many local government units for study and comment (107). WRC also undertook a companion study on coastal flood hazard regulation; it was in process at the end of this period (108).

Policy Activities Relating to Federal-Interstate and Interstate Compacts

As already noted, WRC participated in the establishment of river basin commissions under title II of the Planning Act. WRC also assisted in the preparation of the commissions' comprehensive, coordinated, joint plans and was authorized to review and

comment on such plans before they were sent to the President and Congress. But the river basin commissions were planning organizations that had no authority to construct or operate projects or control water use or pollution loads. They might become first-step organizations that would be succeeded by other types of institutions with authority to both update and implement regional plans. WRC was aware that there were a number of existing types of intergovernmental organizations that had authority to manage river basin operations. These included interstate compact organizations with limited responsibilities and Federal-interstate compact organizations whose responsibilities covered the full spectrum of Federal, State, and local water resources concerns, such as the Delaware River Basin Commission.

WRC had no supervisory authorities over, or formal input into, the workings of any interstate or Federal-interstate compact organizations. It therefore considered its duty was to at least make appraisals and give advice on the effect of these compact organizations on Federal policies and programs. WRC was very eager to establish its jurisdiction to undertake this kind of policy advice responsibility, as a logical extension of its plan-reviewing responsibilities (109).

In January 1967, WRC appointed a special task force to examine and make recommendations concerning the merits of various institutional arrangements for managing river basin operations. WRC adopted the report of this task force and published it in August 1967. It stated that there was no "best" institution for river basin management but that in some instances the Federal-interstate compact organization might be the best means of carrying out a comprehensive plan for a particular basin. The task force urged that consideration be given to the impact of the operations of such a compact organization on existing Federal programs. In addition, the report asserted that Federal representation on compact commissions should be structured so that all Federal agencies whose activities would be subject to the decisions of such commissions would have an input into those decisions (110).

WRC's position on the terms of Federal representation on Federal-interstate compact organizations was soon tested by an incident that occurred in the deliberations of the Delaware River Basin Commission. Congress, in consenting to the 1961 Delaware River Basin Compact, had made several reservations.¹³ One was that the Federal member had the right

¹³The Delaware River Basin Compact was the first interstate water compact to which the United States was a signatory party. The compact was designed to

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to "nonconcur" in any decision of the compact organization that involved its comprehensive plan (111). An issue arose before the Commission in 1965 as to whether a nonfederal pumped storage project on Tocks Island should be included in the comprehensive plan and thus made eligible for construction. The Federal member (who was both the Secretary of the Interior and WRC chairman) sought guidance from the Council as to whether he should refuse to concur with the vote of the Commission to put the project in the plan.

WRC considered the issue and developed a coordinated Federal agency objection on the ground that the plan for the storage project was so vague that it was impossible to foresee whether it would infringe Federal rights in the basin or not. Consequently, it was considered that the Federal member should nonconcur in order to preserve his option to object to the project in the future (112).

Liebman states that the cabinet-level members of WRC considered the Tocks Island incident to be significant because several other Federal-interstate compacts along the same lines as the Delaware River Basin Compact were being proposed in 1968 for the Susquehanna, Potomac and Hudson. The Tocks Island incident was thought to highlight the fact that there were no overall Federal policies on issues arising in the negotiation and administration of such compacts and that no Federal agency was engaged in developing such policies (113).

As a result, the Council drafted and sent to the Bureau of the Budget a proposed Executive order. This proposed order would have authorized the Council to assist Federal negotiations by marshalling water agency information and support, giving policy instructions to Federal representatives on compact commissions, and making recommendations to the President on all water compacts submitted to Congress. But the proposed Executive order was disapproved by the Bureau of the Budget (114).

In February 1969, after the proposed Susquehanna Basin Compact was ratified by the States of New York, Pennsylvania, and Maryland, joint resolutions were introduced in Congress to grant the requisite consent. These resolutions contained a set of

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require all Federal, State, and local water project planners to conform their projects to the commission's comprehensive plan. Since the Federal Government had only one vote on the commission and the comprehensive plan was decided on by majority vote, this meant that the Federal Government could be required to shape its projects to a plan with which it did not agree. The Federal agencies refused to accept this and persuaded Congress to add reservations to the consent legislation limiting the binding effect of the plan on the United States. The most important of these reservations was probably the one involved in the Tocks Island incident.

Federal reservations substantially identical to those added to the Delaware Basin Compact consent legislation to protect Federal program and policy interests.

However, WRC had not been satisfied with the Federal reservations in the Delaware Basin Compact. The Secretary of the Interior asked WRC to review the intergovernmental problems and issues raised by the Susquehanna Compact, which WRC did through its task force on river basin management institutions. Then WRC worked with the State and concerned Federal agencies to develop a new set of Federal reservations which were largely enacted by Congress when it consented to the Susquehanna River Basin Compact in 1970 (115).

These reservations provided, among other things, that the Susquehanna Basin Commission could not add to or change the use of water storage in projects authorized by Congress without reauthorization of such projects and reallocation of their costs. They also provided that nothing in the compact should supersede or impair the powers or jurisdiction of independent Federal regulatory agencies such as the Federal Power Commission or the Atomic Energy Commission (116). However, the States prevailed in their insistence that Federal regulatory agencies should not be allowed to license construction of projects that had been excluded from the plan on the basis of water use or water quality protection considerations, and a proviso to this effect was inserted in the reservations as enacted (117).

Cost Sharing

President Kennedy, in his letter to the ad hoc Council approving Senate Document 97, had asked the ad hoc Council to work on the preparation of up-to-date, uniform, and consistent policies and practices concerning cost sharing, cost allocation, and reimbursement. His letter had stated that study of subjects such as these would be the responsibility of the statutory Council, when it was created (118). But neither the ad hoc nor the statutory Council were able to agree on recommendations in these areas.

Soon after the COR was created, it asked its policy development committee to recommend needed changes in cost-sharing policy. The policy development committee was involved continuously in various cost-sharing studies and prepared recommendations for major changes in cost-sharing policies for water quality improvement and for flood protection. But these recommendations were not accepted by WRC in this period (119).

As noted in chapter 5, the Bureau of the Budget and leading economists advocated the adoption of cost-sharing policies that would assign responsibility for a greater proportion of project

costs to beneficiaries of the projects or taxpayers in the vicinity of projects. They believed this was necessary to assure that the local proponents of water development projects really believed that the benefits of these projects exceeded their costs. However, Liebman, writing in 1971, did not believe that WRC would soon produce any significant changes in cost-sharing policies. He pointed out that WRC, and especially its COR, was composed of the agencies whose construction programs were likely to diminish if State and local governments were required to pay a larger proportion of project costs (120).

Relationship of WRC's Program to the Total Federal Water Resources Program

The first volume of this study discussed the short-lived centralization of water resources program planning by the national resources planning organizations of the New Deal period (121) and the beginnings of coordination of water agency river basin plans in the forties and fifties (122). Its last chapter ends with a review of the recommendations of five official commissions and committees (during 1949-55) for the improvement of Federal water resources programs.¹⁴ All five of these reports recommended that all water resources projects should emerge from plans for the comprehensive and integrated development of entire river basins. All but one of them recommended some type of centralization of national water resources program planning and policies (123).

The responsibilities given to WRC by the Planning Act and presidential directives were a response to long-held expert opinion and the fulfillment of several long-sought policy reforms. At the end of 1970, the Council was still a very new organization but there was no question that it had been effective in accomplishing some of its goals. It had accelerated the trend to selection of future agency reservoir and channel projects out of comprehensive river basin plans. It had encouraged the consideration of many more alternatives (both structural and, at the end of this period, nonstructural) in preparing such plans. But other aspects of WRC's performance were being criticized.

¹⁴(1) The Commission on Organization of the Executive Branch of the Government (the first Hoover Commission), 1949; (2) The President's Water Resources Policy Committee, 1950; (3) The Subcommittee to Study Civil Works of the House Committee on Public Works, 1952; (4) The (second) Commission on Organization of the Executive Branch of the Government, 1955; and (5) The Presidential Advisory Committee on Water Resources Policy (the Eisenhower Cabinet Committee), 1955.

It had been predicted before the passage of the Planning Act that the proposed Water Resources Council would be an inferior instrument to centralize water resources program policies compared to other proposed organizational changes, such as consolidation of all or several water resources programs in one department, giving primary responsibility for planning and policy to an independent authority in the Executive Office of the President, and subjection of interagency river basin plans to an independent board of review. Some contemporary observers considered that the proposed Council would only be another version of ICWR, the national interagency committee device of the fifties. They asserted that such committees had proven incapable, because of interagency logrolling, of developing water policies and plans responsive to contemporary problems and majority political demands (124).

This type of criticism continued after the statutory Council was created. It was to be partly supported by the report of the National Water Commission, which began its studies in 1969 but did not report until after this period was over. The National Water Commission was to conclude that although WRC had improved water resources planning and implemented policy changes on which consensus of all its constituent agencies could be reached, it had failed to provide the policy appraisal and advice mandated by the Planning Act. This was because WRC was dominated by the agencies represented on the COR. WRC's reliance on interagency committees of those same agencies for its policy studies had made it impossible to provide the objective review of agency policies and programs and the proposals for changes that were needed (125).

The substantial identity of the Council with the agencies responsible for reservoir and channel improvement programs also made it difficult for WRC to play a significant role in preparing policies to deal with water problems that were only tangentially related to such programs. It has been a reiterated theme in this history that the two great water resources problems of this period, the ones in which there was the greatest national and local public interest, were:

- (1) Abatement and control of water pollution, and
- (2) Preservation of the natural environments of undeveloped waters and their shores, especially those close to great population centers (such as Great Lakes' shorelines, estuaries, and coastal beaches), and those that were famous, such as the Grand Canyon and the Everglades).

Probably because of jurisdictional custom, WRC did not seriously attempt to play a significant role in solving the Nation's water pollution problem. The Planning Act had given WRC the authority to participate in the solution of all water

resources problems, but WRC was descended from committees whose major concern had been to coordinate, resolve conflicts between, and provide uniform rules for economic justification of basically similar programs of reservoir and channel improvement projects. Moreover, as we have seen, the most significant responsibilities for planning federally-assisted programs of sewage treatment and water and sewer facilities were located not with Federal agencies, but with States and localities. Consequently, at the end of 1970, WRC did not appear to envision itself as playing a greater role in water pollution control planning than it was already playing.

But WRC was very conscious of the importance of resolving conflicts between preservationists and developers and appeared eager to assume a larger role in this effort. It prepared comments on official studies of the problems of coastal zones and estuaries as well as designations of wild and scenic rivers. It incorporated plans for preservation of large areas in its comprehensive plans for future water projects. On several occasions, it eliminated proposed projects from the plans on the basis of preservationist desires of the local people. WRC efforts, however halting, to promote the study and use of nonstructural methods of flood damage prevention, also tended to strengthen the environmentalist's hand.

At the end of this period, as we have seen, WRC was involved in several efforts to incorporate environmental concerns into planning. It attempted to institute new project evaluation procedures to show environmental as well as national income benefits and costs of all proposed projects at the beginning of the planning process. It also attempted to achieve more participation in its studies by State and local governments responsible for shoreline land use planning. It tried to get away from management of comprehensive planning studies by "lead agencies" and to substitute nonagency, regionally-oriented chairmen who would presumably be more responsive to overall regional public opinion, which at this time was frequently environmentalist. In late 1970, WRC also approved the concept of central funding of planning studies (126). The two New England river basin commission type II studies, in which this concept was applied, were expected to result in plans for shoreline preservation and pollution abatement, as well as dams and channel improvements.

WRC was aware that its ability to make full and fair evaluation of the values of developing or preserving water was handicapped by its traditional dam-building agency composition. This composition provided poor representation of the Federal agencies responsible for assisting community and industrial development planning on shorelines and in estuaries and close liaison with the State and local agencies primarily

responsible for such planning. Consequently, in 1969, WRC members approved a proposal to add the Secretaries of Commerce and HUD as full statutory members of the Council (127).

S. 3354 was another recognition of the interrelatedness of water use and land use, and the extent to which the problem of apportioning shoreline land use to protect the environment had replaced the problem of apportioning water supplies on the national agenda. The chairman of the Senate Interior Committee introduced S3354 in Congress in early 1970 to replace the Water Resources Council with a Land and Water Resources Council, authorize regional land and water planning, and Federal funding for State land use planning. S3354 did not pass. But the questions it raised concerning the value of water use planning without coordination with land use planning, and concerning the role that the Water Resources Council and its member agencies should play in integrated land and water resources planning, remained open.

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APPENDIX

FEDERAL WATER POLLUTION ENFORCEMENT CONFERENCES

January 1957 - December 1970

1. *Corney Creek Drainage System*
(Arkansas-Louisiana)
Hearing: January 16-17, 1957
Initiated by Surgeon General, Public Health Service
2. *Big Blue River*
(Nebraska-Kansas)
Conference: May 3, 1957
Initiated by Surgeon General, Public Health Service
3. *Missouri River-St. Joseph, Missouri Area*
(Missouri-Kansas)
Conference: June 11, 1957
Hearing: July 27-30, 1960
Suit Filed: September 29, 1960
Initiated by Surgeon General, Public Health Service
4. *Missouri River-Omaha, Nebraska Area*
(Nebraska-Kansas-Missouri-Iowa)
Conference: (Session 1) June 14, 1957
(Session 2) July 21, 1964
Initiated by Surgeon General, Public Health Service
5. *Potomac River-Washington Metropolitan Area*
(District of Columbia-Maryland-Virginia)
Conference: (Session 1) August 22, 1957
(Session 2) February 13, 1958
(Session 3) April 2-4, May 8, 1969
(Session 3 reconvened) May 21-22, 1970
October 13, 1970
Progress meeting: December 8-9, 1970
Initiated by Surgeon General, Public Health Service
6. *Missouri River-Kansas Cities Metropolitan Area*
(Kansas-Missouri)
Conference: December 3, 1957
Hearing: June 13-17, 1960
Initiated by Surgeon General, Public Health Service
7. *Mississippi River-St. Louis Metropolitan Area*
(Missouri-Illinois)

Conference: March 4, 1958
Initiated by Missouri Health Division; Illinois Sanitary Water Board; Bi-State Development Agency

8. *Animas River*

(Colorado-New Mexico)

Conference: (Session 1) April 29, 1958

(Session 2) June 24, 1959

Initiated by New Mexico Department of Public Health

9. *Missouri River-Sioux City Area*

(South Dakota-Iowa-Nebraska-Kansas-Missouri)

Conference: July 24, 1958

Hearing: March 23-27, 1959

Initiated by Iowa Commissioner of Public Health

10. *Lower Columbia River*

(Washington-Oregon)

Conference: (Session 1) September 10-11, 1958

(Session 2) September 3-4, 1959

(Session 3) September 8-9, 1965

Initiated by Surgeon General, Public Health Service

11. *Bear River*

(Idaho-Wyoming-Utah)

Conference: (Session 1) October 8, 1958

(Session 2) July 19, 1960

Initiated by Utah Water Pollution Control Board

12. *Colorado River and all tributaries*

Conference: (Session 1) January 13, 1960

(Session 2) May 11, 1961

(Session 3) May 9-10, 1962

(Session 4) May 27-28, 1963

(Session 5) May 26, 1964

(Session 6) July 26, 1967

Initiated by New Mexico Department of Public Health; Arizona State Department of Health; Nevada State Board of Health; Colorado Department of Public Health; Utah Water Pollution Control Board; California State Water Pollution Control Board

13. *North Fork of the Holston River*

(Tennessee-Virginia)

Conference: (Session 1) September 28, 1960

(Session 2) June 19, 1962

(Session 3) Called and postponed

Initiated by Tennessee Stream Pollution Control Board

14. *Raritan Bay*

(New Jersey-New York)

- Conference: (Session 1) August 22, 1961
 (Session 2) May 9, 1963
 (Session 3) June 13-14, 1967
 Initiated by Surgeon General, Public Health Service
15. *North Platte River*
 (Nebraska-Wyoming)
 Conference: (Session 1) September 21, 1961
 (Session 2) March 21, 1962
 (Session 3) November 20, 1963
 Initiated by Nebraska Department of Health
16. *Puget Sound*
 (Washington)
 Conference: (Session 1) January 16-17, 1962
 (Session 2) September 6-7, October 6, 1963
 Initiated by Governor of Washington
17. *Mississippi River-Clinton, Iowa Area*
 (Illinois-Iowa)
 Conference: March 8, 1962
 Initiated by Secretary of Health, Education and Welfare
18. *Detroit River*
 (Michigan)
 Conference: (Session 1) March 27-28, 1962
 (Session 2) June 15-18, 1965
 Initiated by Governor of Michigan
19. *Androscoggin River*
 (New Hampshire-Maine)
 Conference: (Session 1) September 24, 1962, February 6, 1963
 (Session 2) October 21, 1969
 Initiated by Secretary of Health, Education and Welfare
20. *Escambia River*
 (Alabama-Florida)
 Conference: October 24, 1962
 Initiated by Florida State Board of Health
21. *Coosa River*
 (Georgia-Alabama)
 Conference: (Session 1) August 27, 1963
 (Session 2) April 11, 1968
 Initiated by Secretary of Health, Education and Welfare
22. *Pearl River*
 (Mississippi-Louisiana)
 Conference: (Session 1) October 22, 1963
 (Session 2) November 7, 1968
 Initiated by Secretary of Health, Education and Welfare
23. *South Platte River*

(Colorado)

Conference: (Session 1) October 29, 1963

(Session 2) April 27-28, 1966

(Session 2 reconvened) November 10, 1966

Initiated by Governor of Colorado

24. *Menominee River*

(Michigan-Wisconsin)

Conference: November 6-8, 1963

Initiated by Secretary of Health, Education and Welfare

25. *Lower Connecticut River*

(Massachusetts-Connecticut)

Conference: (Session 1) December 2, 1963

(Session 2) September 27, 1967

Initiated by Secretary of Health, Education and Welfare

26. *Monongahela River*

(West Virginia-Pennsylvania-Maryland)

Conference: December 17-18, 1963

Initiated by Secretary of Health, Education and Welfare

27. *Snake River-Lewiston, Idaho-Clarkston, Washington Area*
(Idaho-Washington)

Conference: January 15, 1964

Initiated by Secretary of Health, Education and Welfare

28. *Upper Mississippi River*

(Minnesota-Wisconsin)

Conference: (Session 1) February 7-8, 1964

(Session 2) February 28, March 1 and 20, 1967

Initiated by Secretary of Health, Education and Welfare;
Governors of Minnesota and Wisconsin

29. *Merrimack & Nashua Rivers*

(New Hampshire-Massachusetts)

Conference: (Session 1) February 11, 1964

(Session 2) December 18, 1968

Workshops: October 20-21, 1970

Initiated by Secretary of Health, Education and Welfare;
Governor of Massachusetts

30. *Lower Mississippi River*

(Arkansas-Tennessee-Mississippi-Louisiana)

Conference: May 5-6, 1964

Initiated by Secretary of Health, Education and Welfare

31. *Blackstone and Ten Mile Rivers*

(Massachusetts-Rhode Island)

Conference: (Session 1) January 26, 1965

(Session 2) May 28, 1965

Initiated by Secretary of Health, Education and Welfare

32. *Lower Savannah River*
(South Carolina-Georgia)
Conference: (Session 1) February 2, 1965
(Session 2) October 29, 1969
Initiated by Secretary of Health, Education and Welfare
33. *Mahoning River*
(Ohio-Pennsylvania)
Conference: February 16-17, 1965
Initiated by Secretary of Health, Education and Welfare
34. *Grand Calumet River, Little Calumet River, Calumet River,
Wolf Lake, Lake Michigan, and their tributaries*
(Illinois-Indiana)
Conference: (Session 1) March 2-9, 1965
(Technical Session) January 4, 5, 31, February 1,
1966
(Session 2) December 11-12, 1968, January 29, 1969
(Session 2 reconvened) August 26, 1969
Initiated by Secretary of Health, Education and Welfare
35. *Lake Erie*
(Michigan-Indiana-Ohio-Pennsylvania-New York)
Conference: (Session 1) August 3-5, 1965
(Session 2) August 10-12, 1965
(Session 3) March 22, 1967
(Session 4) October 4, 1968
(Session 5) June 3-4, 1970
Initiated by Secretary of Health, Education and Welfare;
Governor of Ohio
36. *Red River of the North*
(Minnesota-North Dakota)
Conference: September 14-15, 1965; January 18, March 4, 1966
Initiated by Secretary of Health, Education and Welfare
37. *Hudson River*
(New York-New Jersey)
Conference: (Session 1) September 28-30, 1965
(Session 2) September 20-21, 1967
(Session 3) June 18-19, 1969
(Session 3 reconvened) November 25, 1969
Initiated by Secretary of Health, Education and Welfare;
Governors of New York and New Jersey
38. *Chattahoochee River and its tributaries*
(Georgia-Alabama)
Conference: (Session 1) July 14-15, 1966
(Session 2) February 17, 1970
Initiated by Secretary of Interior

39. *Lake Tahoe*
(California-Nevada)
Conference: July 18-20, 1966
Initiated by Secretary of Interior
40. *Moriches Bay and Eastern Section of Great South Bay and their tributaries*
(Long Island, New York)
Conference: (Session 1) September 20-21, 1966
(Session 2) June 21, 1967
Initiated by Secretary of Interior
41. *Penobscot River and Upper Penobscot Bay and their tributaries*
(Maine)
Conference: April 20, 1967
Initiated by Secretary of Interior
42. *Eastern New Jersey Shore—from Shark River to Cape May*
(New Jersey)
Conference: November 1, 1967
Initiated by Secretary of Interior
43. *Lake Michigan*
(Michigan-Indiana-Illinois-Wisconsin)
Conference: (Session 1) January 31, February 1-2, 5-7,
March 7-8, 12, 1968
(Session 2) February 25, 1969
(Session 3) March 31, April 1, May 7, 1970
Workshops held September 28-October 2, 1970
Conference was scheduled to reconvene March 23-24, 1971
Initiated by Governor of Illinois; Secretary of Interior
44. *Boston Harbor*
(Massachusetts)
Conference: (Session 1) May 20, 1968
(Session 2) April 30, 1969
Initiated by Secretary of Interior
45. *Lake Champlain*
(New York-Vermont)
Conference: (Session 1) November 13, December 19-29, 1968
(Session 2) June 25, 1970
Initiated by Secretary of Interior; Vermont Department of Water Resources
46. *Lake Superior and its tributary basin*
(Wisconsin-Minnesota-Michigan)
Conference: (Session 1) May 13-15, September 30,
October 1, 1969
(Session 2) April 29-30, August 12-13, 1970

Session 2 was scheduled to reconvene
January 14-15, 1971

Initiated by Secretary of Interior

47. *Escambia River Basin*
(Alabama-Florida)
Conference: January 20-21, 1970
Initiated by Governor of Florida
48. *Perdido Bay*
(Florida-Alabama)
Conference: January 22, 1970
Initiated by Governor of Alabama
49. *Mobile Bay*
(Alabama)
Conference: January 27-28, 1970
Initiated by Secretary of Interior
50. *Biscayne Bay*
(Florida)
Conference: February 24-26, 1970
Initiated by Governor of Florida
51. *Dade County*
(Florida)
Conference: October 20-21, 1970
Initiated by Governor of Florida

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