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THE CORPS OF ENGINEER ACTIVITIES ON POLLUTION AND WATER QUALITY CONTROL[1]

FRED J. DICKSON[2]

Mr. Chairman and Members of the Society:

The majority of you know that I was a State employee for a number of years. It is felt that I understand your various problems. Since the first of this year I have been employed as a biologist by the South Atlantic Division, Corps of Engineers. Since then I have had the opportunity to observe the activities and efforts of the Corps in providing the fullest utilization and benefits of its projects to the public. I now have a much better perspective of the development, management and conservation of the water resources—with particular reference to fish and wildlife phases. I feel that many of you may have some misunderstandings, as I did, about the Corps' activities, therefore, with your indulgence I would like to tell you as simply and plainly as I can, just what I have found to be the views and objectives of the Corps in this important work and how we can all move together to do a better job in preserving and enhancing our heritage.

Let me sincerely say the Corps of Engineers has a strong desire to cooperate with local, State, and Federal organizations. Many consultations are held each year with the responsible fish and wildlife agencies.

We have all been interested in the effects pollution and water quality have on our fish and wildlife, and until the most recent legislation, very little could be done by those most concerned.

It is realized that cooperation in water quality control is largely dependent on the free exchange of information among the engineers, scientists, and administrators from various levels and agencies of government, from industry, and from universities to explore research needs in the field of streamflow regulation for quality control. All planning must be carried out with multiple purpose needs and possibilities in mind.

Agencies which have authority to review, accept or reject a plan of development must rely on something more tangible and objective than human judgment as a means of fitting these demands into a plan of development and as a means of evaluating it.

This is the reason why we are required to show economic justification, generally as a benefit—cost ratio based on dollar evaluations of the costs of proposals versus the benefits they will produce over the life of the project.

[1] Presented at the Southern Division, American Fisheries Society, 29 September to 2 October, 1963, Arlington Hotel, Hot Springs, Arkansas.

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We need your help in developing plans and measures for preservation and enhancement of fish and wildlife which are as specific as possible, to give us something tangible to incorporate in plans and projects. Generalities are not sufficient.

Last June 12, Lt. General Walter K. Wilson, Chief of Engineers, U. S. Army, made a statement before the Natural Resources and Power Sub-Committee of the Committee on Government Operations, in which he outlined the role of the Corps of Engineers in the Nation's over-all effort to deal with the problem of pollution; and the status of the Corps' civil works Program.

Some of you have probably heard or have read a transcript of the Chief of Engineer's statement, but for those of you who have not, I want to quote several paragraphs here which I think are most enlightening and will be of interest to you all. I will also quote here some remarks made by several of his assistants in order that you will have a complete picture of the Corps' objectives.

General Wilson stated in part that:

"We now have in operation 214 reservoirs having an aggregate capacity of 165 million acre-feet. These reservoirs provide for: the storage of flood waters to protect downstream valleys; the regulation of rivers in the interest of navigation; the generation of hydro-electric power at installations having a capacity now totaling eight million kilowatts; the storage of water for municipal and industrial use; recreational opportunities furnishing 127 million person-days of healthful outdoor recreation in 1962; and the regulation of the streams for pollution abatement, or more broadly, for the improvement of water quality.

"It is, of course, the latter benefit of reservoir systems in which this Subcommittee is most interested. Before going into it further, however, it is important that we relate quality control to comprehensive river basin development in order to bring the subject into proper perspective.

"It is well known that for more than a half century the United States has been working on the problems of how to achieve optimum development of its great river systems. The basic concept of the comprehensive, multiple-purpose, and unified river basin program was first brought forcibly to public attention through the so-called 'Conservative Crusade' led by President Theodore Roosevelt. Since that time the concept has gradually established itself and gained widespread support. Many Commissions and similar bodies have urged the Nation to put it fully into effect. The present Administration has accepted and given vigorous support to the concept of comprehensive river basin development. It has called upon the Federal Agencies to cooperate with the States in the formulation of comprehensive plans for all of the Nation's river basins. The Administration's program is now in full swing. I am glad to say that the planning of reservoir systems is the major feature of this program, and that the improvement and control of water quality is one of the main purposes of the reservoir systems now being planned.

"The Corps of Engineers has been preparing basin-wide multiple-purpose plans for many years and with the cooperation of other agencies —Federal and State—much has already been accomplished in all sections of the country. It was not until recently were the available legislative authorities broad enough to enable the Corps to do a truly comprehensive job of basin planning and development. The legislative base has been gradually broadened to assure that all purposes, including water quality control, can be considered in planning and developing Federal water projects.

"The important thing now is for all agencies to use the authorities and policies provided by the Congress to formulate plans that will meet our needs for water of the proper quality, in the right amount and at the right time to serve all purposes. Recently, the Corps of Engineers has attempted to inventory the needs likely to develop between now and 1980. In this connection, we have made full use of the studies made by Federal and other agencies for the Senate Select Committee.

"We estimate that by 1980 the United States will need a total of 409

million acre-feet of reservoir capacity in addition to that already built; about 323 million acre-feet would be constructed by the Corps. We will need the generation of hydroelectric power having a capacity of 33 million kilowatts, and to meet the demands for 300 million person-days of recreation. The controlling factor in arriving at this huge estimate is the need for the release of water to maintain the quality of our rivers. It is very important that we all conceive of river regulation as a multiple-purpose undertaking. More specifically, we must plan future reservoir systems as a means of regulating our rivers for flood control, navigation, the provision of municipal and industrial water, increased power production, recreation, fish and wildlife, and maintenance of water quality. The biggest job confronting the Corps of Engineers during the next half century will be the planning and construction of the great systems of reservoirs that will be needed to achieve a very high degree of river regulation for all of these purposes."

Mr. Eugene W. Weber, Deputy Chief of Civil Works for Policy, Office of the Chief of Engineers, U. S. Army, discussing 'Stream Flow for Water Quality Purposes,' stated that:

". . . The Corps' activities in regulating stream flow for water quality control come under three categories; namely, completed projects, authorized projects, and projects being studied for possible future authorization."

He stated that at the 214 completed projects in the first category, the Corps can continue to make minor modifications and adjustments in operations for water quality objectives whenever they are consistent with the other purposes for which the projects were authorized and built. Also, the Corps can recommend major modifications of completed projects to Congress whenever studies show this to be a justifiable course of action.

The second category of projects already authorized include those either not started or only partially completed. The Corps now has authority to construct over 200 projects containing some 90 million acre-feet of storage capacity. Of these, 81 reservoirs with 56 million acre-feet of capacity have been placed under construction and the remainder have not been started. Mr. Weber stated that: "On all of the projects not yet started and on those where planning for certain phases of construction is still under way, the new Public Law 87-88 provides a basis for considering modifications to previously authorized plans to include provisions for flow regulation for water quality control if the following criteria are met:

a. The modification of the project must be economically justified.

b. The status of the planning and construction of the project must be such that it is practicable to accomplish the necessary changes without undue delay or unreasonable increase in cost over that which would have been incurred if water quality control had been originally authorized as a project purpose.

c. The modification must not have a material adverse effect on the purposes for which the project was authorized originally.

d. Satisfactory advice must be received from the Secretary, Department of Health, Education and Welfare relative to the need for and the value of water quality control storage.

e. The Congress must be informed of our intention to modify the project and of the views of the Secretary, Department of Health, Education and Welfare, by letters to the Public Works and appropriations committees of the Senate and House."

Also of particular interest Mr. Weber stated that: "Last year we informed Congress that we were modifying two projects, John W. Flannagan Reservoir, Ohio River Basin, Virginia, and DeGray Reservoir, Ouchita River Basin, Arkansas, to include water quality storage as a primary project purpose. We feel certain that many other authorized projects can be modified to include this important purpose as detailed planning studies proceed. From the standpoint of basic authority and policy, therefore, the situation with respect to authorized projects is satisfactory."

In the third category of projects, which are those being studied for possible future authorization, Mr. Weber stated: ". . . the enactment of

Public Law 87-88 in 1961 has made it clear that Congress wants provisions for water quality control considered just as fully as other purposes on which policy declarations were previously provided. We also find that it is in this area of possible future projects where the Corps' prospective reservoir program can do the most good for water quality control."

In summary Mr. Weber stated that; ". . . The principal requirement is for gradually increasing funds of basin-wide multiple-purpose surveys in order to permit us to meet the construction schedule for additional reservoir storage needed by 1980. By that time it is estimated the United States will need about 94 million acre-feet of additional storage for flood control and about 315 million acre-feet for water quality control and other purposes dependent upon low flow regulation."

Mr. Franklin F. Snyder, Engineering Division, Civil Works, Corps of Engineers in his statement to the same Committee specifically on Engineering Activities on Water Quality Control made these remarks: "In the Corps of Engineers' water resources development, water quality control was authorized as a specific purpose in only a few of the 214 reservoirs constructed to date. However, reservoir regulation for quality control has been and is being considered wherever it is consistent with the purposes for which the projects were authorized. In nearly all cases the effect of the authorized regulation is incidentally beneficial to water quality control. In the engineering, planning, and design of Corps projects, recommendations of the Public Health Service, Fish and Wildlife Service, and state public health and conservation agencies are given full consideration with regard to providing low-water regulation in the interest of improving the water quality.

"LOW FLOW REGULATION

Some of the Corps reservoirs contain storage allocated for low flow regulation for water quality control. Others have storage allocations for low flow regulations for power and navigation which at the same time provide incidental benefits to pollution abatement in the river reaches below the reservoirs. The problem most frequently encountered in regulating a reservoir for low flow control is the period of no release at hydroelectric projects during times when there is no generation of power. Multiple purpose projects with hydroelectric power installations are usually operated as peaking plants, and frequently, have periods of no generation which, over weekends, may exceed 48 hours. The Corps has built reregulating basins below some multiple purpose reservoirs to assure some flow in the stream during periods of no generation at the main power plant. At other hydroelectric projects some off-peak power is produced, even though it is not the most economic generation, in order to meet minimum standards of flow or river temperature. Corollary benefits, however, should be recognized. Increased flows in addition to aiding quality, sometimes enhance recreation downstream, benefit fish life, and improve navigation. Supplementary releases are made, from Clark Hill Reservoir, during off-peak periods on weekends to satisfy navigation requirements. These low flow releases from Clark Hill are adequate at the present time for abatement for water pollution problems and to stabilize to a large extent the water temperature at the intake of the U. S. Atomic Energy Plant downstream.

Reservoir releases for water quality control, especially when coupled with releases for navigation, water supply, or the generation of power, result in lowering the reservoir surface. This drawdown will adversely affect recreation on and around the reservoir pools.

"EFFECT OF RESERVOIR IMPOUNDMENT ON WATER QUALITY

In recent years consideration has been given to the installation of multi-level regulatory outlets or power intakes in large dams to facilitate the withdrawal of discharged waters from various levels, primarily as a mechanism for regulation of temperature and dissolved oxygen content of the waters released at such dams. With such multiple outlets, release schedules have been envisioned which might establish optimum conditions for warm-water or cold-water fish in the stream

below. For example, in the Pittsburg District and one in the Huntington District have such regulatory outlets . . .

"POSSIBLE PROJECT MODIFICATIONS

With water use increasing and more reservoirs being put into operation it is recognized that the dissolved oxygen content of the releases from deep reservoirs is a potential source of adverse effects, although no acute problems now exist below Corps reservoirs. . . . Modification such as a weir can be constructed upstream from the outlets at some projects so that releases will be drawn from the upper portion of the pool. At some projects oxygen could be reintroduced into the discharged water by pumping air through diffuser pipes.

"RESEARCH

The Corps of Engineers is planning an expanded investigative program to measure changes in the quality of water impoundment in existing typical reservoirs, and to develop practical methods of improving the quality of water released from reservoirs. Involved in this program will be the measurement in time and space of physical properties (such as oxygen content, temperature, stratification and movement of water through the reservoir), the chemical properties (such as concentrations of dissolved ions, gases, and other materials), and biological productivity. The study will also consider problems of oxygen content, temperature, and the positive and negative effects of water pollution, both upstream and downstream from the reservoir. This program will be accomplished by Corps field offices working in conjunction with a recognized professional fisheries-research agency, as well as U. S. Public Health Service and selected educational institutions having qualified scientists in this field. The investigations will be accomplished initially with available instruments, although it is realized that further instrumental development work is desirable. It is recognized that the Corps of Engineers cannot hope to contribute more than a fraction of the basic research that is obviously needed in matters related to water quality. However, as the most significant aspects from a water resource planning and development standpoint are identified, the Corps is prepared to undertake in cooperation with other agencies, the sponsorship or support of specific research activities as an essential adjunct to its water resource development mission.

"CONCLUSIONS

In planning for water resources development and particularly in basin-wide studies, the Corps of Engineers will continue to give increased emphasis to water quality considerations, both by specific provisions as well as in the indirect benefits obtainable through the design for navigation, hydroelectric power, industrial and domestic water supply, irrigation, drainage, protection of stream banks, and provisions of permanent pools in reservoirs for fish and wildlife conservation and for recreation. These efforts will be coordinated with the programs of other interested state and federal agencies.

"With respect to existing projects the Corps of Engineers will continue to study the technical and economic aspects involved in modification of reservoir regulation with the objective of improving results in light of experience and changing requirements for water quality. In the event basin studies indicate that completed projects should be modified structurally, or that changes in authorized purposes or supplementation by additional projects is necessary to meet future requirements for water quality control, recommendations will be made to Congress for the required authorization.

"Constant attention will continue to be directed toward observation of effects of projects on water quality to permit proper evaluation prior to the development of water quality problems. Possible improvement measures are being investigated and necessary monitoring techniques are being initiated. As we identify the most significant aspects from a water resource planning and development standpoint, we are prepared to undertake the necessary investigations and to cooperate in

the support of specific research activities by others as an essential adjunct to our water resources development mission."

I have purposely quoted most of the above rather than rephrasing it in my own words so you and the Society may have this information in its original context and meaning which is so vital to cooperation needed by biologists and others interested in water quality improvement of our lakes and streams.

Cooperation in water quality control is largely dependent on the free exchange of information. Recognition of the primary objectives of a project must come early in its history. Likewise, secondary purposes of what is generally considered a better concept, "Compatible uses," should also be defined. Rarely does any project confine itself to a single purpose. The point here is that all necessary and potential uses must be recognized and considered when planning is started.

Field surveys must be made to determine the level of use which can be provided, the capacity for future growth, and the effects one type of use may have on the quality and quantity of water passed downstream or made available for other uses. This information and often more, must be in the hands of the designers of the project before their work has gone very far.

Frequently, operating plans for dams or other water control structures dictate the type of uses that a given body of water may serve but at least some beneficial fish and wildlife features can be included if technical data is furnished early enough in the planning stages. The extent of drawdown, seasonal and daily variations in flow pattern, and the effects of these on water quality, as well as quantity, must be understood in the light of available knowledge. The biologist must be able to think in terms of generating capacity, kilowatt hours, density currents, operation of the rule curve, and waste assimilative capacity. I can assure you from my brief tenure with the Corps that its engineers want and need your information on facts that can be substantiated.

ESTUARIES AND THEIR RELATIONSHIP TO RECREATION

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America's interest in outdoor recreation is soaring upward at a tremendous rate. This interest has produced some surprising figures and portend the future. Let's examine some of the statistics for their significance to us.

Participation in outdoor recreation grew at a rate of about 10 percent a year in the 10-year period, 1950 to 1960. This was six times faster than the population grew.

By the year 2000 our population will likely double—from 180 million today to 350 million. It will be a more compact population, with nearly 75 percent living in urban areas. It will also be younger, with about 17 percent in the active 15- to 24-year age group as compared to the present 13 percent. This population is expected to have both more disposable income, i. e., income not needed for necessities and more leisure. All these factors point to greater demands for outdoor recreation. Furthermore, many most-wanted outlets require or are enhanced by water. In short, many more people will want to use water resource areas more frequently.

One index of the trends of outdoor recreation is the sales of outboard motors as reported by the National Association of Engine and Boat Manufacturers. In just 10 years, from 1950 to 1960, the number of outboard motors more than doubled from two million eight hundred thousand to six million 50 thousand. A corresponding increase has oc-

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