

ENVIRONMENTAL QUALITY DECISIONS AND WATER QUALITY CONTROL

L. R. Dunham
State Water Resources Control Board
Sacramento, California

For a number of years my work as a biologist has been primarily in the field of water quality control. Over this period of time the nature of the work has changed and the role of the biologist has had to change also. Not too long ago it was called "pollution control" and there were only a few people involved who were almost considered outcasts because they didn't work on either research or management projects. At that time, the work was primarily trying to determine the cause and source of fish kills. There was not enough money or time to work on complex pollution problems.

Gradually the work changed because the "pollution biologists" were asked, with increasing frequency, to predict the effects of waste discharges on fish and wildlife for pollution control agencies. Then came requests to specify water quality control standards for the protection of fish and wildlife and the prevention of pollution. The gross pollution problems in California were being controlled and more emphasis was being placed on planning. In the transition period, agencies began to change their name to incorporate the term "water quality control" to reflect the broader scope of their work, and the titles of the biologists soon followed. The role of the water quality biologist was changing but, at the same time, it became necessary to draw upon the specialized knowledge of other fish and wildlife workers to assist in making the predictions relating to the effects of complex waste discharges. I'm sure many of you have been called upon to assist in the development of water quality criteria needed to protect some form of aquatic life. At first it was necessary to draw upon knowledge available from other work but, as money became available, research projects were funded for the purpose and the role of other biologists began to change. Work in both the field and laboratory was being directed toward the development of information for water quality control.

As the complexity of water quality problems increased, special studies were necessary and biologists were often made part of a team which might include engineers, chemists, statisticians, hydrologists and economists to predict the effects of different water quality control measures. The various studies funded by State and Federal agencies in the Sacramento-San Joaquin River Delta are examples. Intensive investigations over several years were necessary to relate the life history of various plants and animals to changes in salinity, temperature, dissolved oxygen and other water quality factors. Much of this information was presented in the form of reports and testimony to the State Water Resources Control

Board and it formed the basis for the controversial "Delta Decision" ^{1/} which required releases of water from projects controlling outflow from the Delta. These outflows are designed to maintain the levels of salinity necessary to protect fish and aquatic life in the Delta and to maintain certain forms of vegetation important for waterfowl in the Suisun Marsh.

Other studies involving some of you have been made in San Francisco Bay, Los Angeles Harbor, major rivers, the Salton Sea and in the Pacific Ocean. The general objective of these studies has been to predict the effect of potential changes in water quality on fish and wildlife.

Probably many of the biologists engaged in water quality related work never consciously intended to work in that field. Most of us got started because we were interested in maintaining fish and wildlife in their natural state, and changes in water quality were a threat to the environment necessary for these animals. Perhaps we didn't intend to become planners but, as the role of water quality control agencies changed, we found it necessary to change our role to protect a satisfactory environment for fish and wildlife each time someone proposed a change in water quality.

Now many of us have an opportunity to change our role again and take part in the planning process as members of the teams which develop plans for water quality management in each major river basin. Each State is developing water quality control plans for the protection of its water resources to meet the requirements of the Federal government. The State Water Resources Control Board in California will also use these plans to fulfill their responsibility under the Porter-Cologne Water Quality Control Act. The plans are intended to be comprehensive in scope. They will detail the activities that affect water quality in each of the 16 hydrographic basins of California and predict the changes that will occur in these activities in the next 30 years. They will also detail the water uses in each basin and consider various alternatives for water development in each decade. The wastes generated in each basin will have to be estimated and plans developed for treatment and disposal or reclamation of wastewater.

Most of the work will be done by State agencies and private contractors for a total cost of about 7 million dollars. Some of you are already involved in this work and others will be. I believe the important thing to remember is that these plans cannot serve their purpose if they become simply waste management plans and hardware layouts. They have to become plans to make the best use of our water resources and they have to be prepared with a deliberate awareness of the total interrelationship with other factors in man's environment. It will be necessary for biologists to assist in the planning process and help define alternative developments, but they must also be ready to strongly advocate positions on these alternatives. They will have to help the planners and the public determine what will constitute a desirable environment.

I was surprised to hear John Teerink state in his talk yesterday about the State Water Project that it was not their job to try to determine the impact of the project on our society. It was as if they could build the project according to the wishes of the people and then wash their hands of the whole thing. History has shown that Pontius Pilate couldn't do that 2,000 years ago and I believe it will show that water resource developers can't do it either.

The basin planning effort will try to bring socio-economic factors into the consideration of alternatives for water resource management, and the impact analysis of each alternative will consider more than the primary impact on our environment. This is a new thing and we don't pretend to have all the answers on how to do it, or all the authority necessary to make the decisions involved. Certainly some of the factors which must be considered relate to land use and the Board has no real authority in that area at this time. The only thing we can do is to try to make the best analysis possible to expose the decisions which must be made by our society and make recommendations to the legislature.

^{1/} Decision 1379, Delta Water Rights Decision of the California State Water Resources Control Board; adopted July 28, 1971.

We don't expect it will be an easy job. The Delta Decision which I referred to earlier has shown us that there are powerful forces which will resist decisions being made by some public process which interfere with special interests. The Board may be hampered in its future work. Not too long ago it wouldn't have mattered so much because there was no evidence to show that the general public cared enough to change their life style, but times have changed. There are positive indications that people are willing to change things if someone can show them what to do and they can believe it will do some good. Who would have thought that people would force detergents to change, or stop an SST program, or stop a freeway or support a wild river rather than a water development. It's true that these actions are impulsive and emotional and not based on adequate information, but I believe it demonstrates the degree of concern. It's probably also true that cooler heads will have to prevail in the future and that decisions by our society will have to consider economics and employment and thus taxes, but I don't believe the public concern for the environment will die. The public only needs to be shown that there are ways to cope with these problems and still have a desirable place to live in the future. Who knows, maybe some of you will be the ones to show them.

The subject of future power plants also came up yesterday and it happens to be a perfect example of how our decisions can have many ramifications, and how issues are raised which must be explored so society and public agencies can make satisfactory decisions.

It was mentioned that we can forecast a doubling of our demand for electrical energy about every 10 or 12 years if the present trends continue. Utilities operating in California are required to make forecasts for the Public Utilities Commission and demonstrate that they can meet the demand. Most of the hydroelectric potential has been used but the utilities have several options available for steam powered generators. They can choose among several fuels such as oil, gas, coal or nuclear energy. These plants are only 30 to 40 percent efficient so the excess energy in the form of heat must be wasted to the environment. The usual method is to pump water through a condenser to carry away this waste heat. A plant generating 1 million kilowatts, or 1,000 megawatts as it is called, may utilize about 1,500 cubic feet per second of water through the condensers and heat it about 18° F in a few seconds. The least expensive place to get this quantity of cool water is from the ocean where it is pumped through once and discharged. As an alternative, water can be pumped through a cooling tower and recirculated through the condensers. In this process, water is lost by evaporation. A 1,000 megawatt plant may evaporate 20,000 to 25,000 acre feet of water per year. This constant evaporation causes the concentration of dissolved salts to increase in the cooling water and occasionally some water must be discharged and fresh water added to maintain the correct level of salts. The water discharged in the process is so high in salts that it would be harmful to plants if used for irrigation. The heated wastewater from "once-through" cooling can be harmful to aquatic life if it is discharged into an area where there is not adequate dispersion.

The choice of fuels, cooling method and site location would simply be a matter of economics if the decision was made entirely by the utilities because they must try to provide electricity at the lowest rate possible.

Plants in Southern California where we have the greatest demand have commonly used oil for fuel and ocean water for cooling in the past. Air pollution problems caused the utilities to consider other fuels. Since oil and gas have to be imported to California, it was natural to consider nuclear power. The first problems with that alternative were the seismic protection standards and the isolation requirements of the Atomic Energy Commission.

These problems led some utilities to develop power plants in the less-densely populated States of New Mexico, Arizona and Colorado where they could use coal from the extensive deposits there, or use nuclear fuel. However, problems began to develop there also because of the strip mining of coal, the effects on air quality, the addition of salts to the Colorado River and the long power-transmission line corridors. In addition, there is a growing resentment among people in the other western states when they see their environment degraded to furnish power to Southern California.

At about the same time, the State Board developed a temperature control policy for discharges of heated waste to the interstate and coastal waters. This was a single purpose policy designed to protect aquatic life and water quality. It prohibited the discharge of heated wastes to cold trout streams and made it very difficult to discharge into warm water streams. New discharges into estuaries and enclosed bays were prohibited if they were more than 4° F above the natural water temperature. Discharges can be made to the ocean but the requirements are stringent and it will be expensive to meet them.

Faced with the problems of ocean discharge in California and plant siting in the neighboring western States, several nuclear plants are now being proposed at inland sites where they would use cooling water from the California Aqueduct. As you heard from Mr. Teerink, if the present increase of power demand continues and only one-half of the plants are at inland sites by the year 2020, these plants would evaporate 3 million acre-feet of water per year. That's about the amount of water stored in Shasta Dam. We can't afford to allow that much water to be evaporated and lost to use. If we did, it would mean that more water would have to be developed from other sources.

This is an example of the kind of dilemma we are facing in some of our decisions regarding the environment. Our air, water and energy resources are at stake as well as our way of life. So far we haven't been able to satisfactorily explore the alternatives of a change in our life style but this is the next place we have to go. As a beginning, the Resources Agency has contracted with the Rand Corporation to give us some indication of the extent to which we can change future electricity demand and how it would be accomplished.

We don't know where this will lead but I'm sure that some of you will have an opportunity to help explore the alternatives and present the information to the public for a decision.