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THE WATER CRISIS IS PRESENT

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The growth of the earth's population is recognized everywhere as a threatening problem impinging on the world's resources. Most often the danger is stated in terms of an approaching food crisis.

In the United States, the people have been made aware by the recent Secretary of Agriculture that our population has grown to the point at which there no longer are food surpluses.[1] The food crisis, therefore, seems more imminent. Nevertheless, no one envisions hunger stalking the Mississippi Valley.

A water crisis meantime has stealthily crept up from behind.

The water crisis is present in California, it is in the Colorado River Basin, and it is found in most of the river basins across the nation. It is engendered by the same forces that are expected in the future to develop the food crisis.

There are more millions of people to care for every year, and the number continues to grow. There is more crowding into cities which ever demand more water. There are more industries, and they and the people produce more wastes to dispose of and to transport in the nation's streams, many of which are already overburdened and degraded beyond acceptable limits. There is more need for recreation and open spaces as the hills are terraced for housing pads and street grids are laid upon orchards and farms. All of these factors helped to create the water crisis, which is one involving both water supply and water quality.

The new contest between opposing sides of the quality-quantity conflict, was called "The Battle of the Twenty-First Century" by me in a presentation to the Commonwealth Club in San Francisco recently for it then seemed to me that the acute form of the problem was still in the future. Under the leadership of the Honorable Carley V. Porter and his Assembly Water Committee, the California Legislature took cognizance of the problem in 1967 through enacting AB 163. This was an effort to meet the issue and forestall the intensification of the problem in California through creation of a State Water Resources Control Board which came into being in 1967. Placing the control of quantity of water to be used, and the quality of what remains, in a single state agency is a timely action.

The opening guns of the battle of the Twenty-First Century,

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1. Address by Orville L. Freeman, Secretary of Agriculture, The International Agr.-business Conference, in Chicago, Illinois, May 10, 1967.

however, have already been fired, and it is not likely that hostilities can be postponed until 2001 A.D., as I once had thought.

This conflict in California, at least, has been inevitable since the Gold Rush. California has had more skirmishes over it than have occurred elsewhere so far, but the quality-quantity conflict is present wherever population and water use have grown to the point of criticality in the particular basin involved. Today this includes a very large share of the watersheds in the United States. Some areas, to be sure, are better watered than California or the Colorado River Basin. The opportunity to misuse the water supplies without developing intolerable situations in well-watered basins has been greater, but there has been no brake on intensifying misuse, and the day of reckoning is close at hand in them, as well as in the drier regions. The people who live in such basins will have a longer period of grace, but they are not home free.

California early in its history went through one catharsis when farmers in the valleys marshalled their political strength, and through legislation stopped the hydraulicking for gold in the Sierras.[2] Great water projects were built in the mountains to serve the miners as the techniques of hydraulic mining advanced so that more massive deposits of tertiary sands could be attacked through the iron monitors. The hydraulic mines were capitalized by international investors and at their height, they constituted the state's most important business. Also, in early California, mining had a glamour that gave the industry a sentimental advantage over mere farming. The sluicing of sediment into mountain streams and the tunneling of channels to carry the mining debris from one tributary to another finally spread a threat to the safety and well-being downstream against farm and city folk alike. Even this rich, glamorous industry, supported by tradition and sentiment, fell before the wrath of the people. Not, however, before permanent changes had been wrought through the aggradation of stream beds and the deposit of thick mantles of slickens[3] over many thousands of acres of valley lands. The cessation of hydraulic mining was a victory, however, for clean water and for the principle that one interest should not use the water and its land in such ways as to damage neighbors downstream.

Now a century later, the stage is being set for the repetition of conflict not greatly different, river basin by river basin across the con-

2. R. Kelley, *Gold versus Grain, California's Hydraulic Mining Controversy* (1959).

3. Slicken is a thin layer of extreme fine silt sometimes deposited by flood waters of a stream.

tinent. Today the irrigator and the city dweller are contributing a share of the pollution that is being found noxious.

The federal government took the action that revealed the presence of the water crisis. Under the Clean Water Act,[4] it required the states to establish quality standards on interstate streams. If the states failed to do so, the federal government threatened to promulgate its own standards. The deadline for state action was June 30, 1967.

Most states attempted to comply with the fedeal requirement. But the early appraisal of their efforts made by the Secretary of the Interior was that most states failed to establish adequate standards.

In California, the former State Water Pollution Control Board wrestled for several years with the problem of fixing statewide criteria for water pollution control, but it could not bring out much agreement and its action was inadequate. In its new guise, as the State Water Quality Control Board, the board began more recently to develop water quality standards to be maintained in the Sacramento-San Joaquin Delta. These efforts were inconclusive, however, at the time the new federal law threw the whole movement not only into high gear but into overdrive.

For the most part, in California as elsewhere, the water quality authorities, and the public too, have been convinced of the necessity of maintaining relatively high water quality standards. The state authorities have tried to work out their programs to do so. The Legislature has consistently pointed in that direction.

The new California law[5] carries this direction to the new water Resources Control Board even a step further. Section 13000.2 reads:

> The Legislature finds and declares that, because of the widespread demand and need for full utilization of the water resources of the state that the granting of permits and licenses for unappropriated water and the disposal of wastes into the waters of the state shall be so regulated as to achieve highest water quality consistent with maximum benefit to the people of the state and shall be controlled so as to promote the peace, health, safety and welfare of the people of the state.

The new board, it might be said facetiously, may find it more difficult to conduct its work so as to preserve the peace than to

4. Federal Water Pollution Control Act §§ 1 (a), 2-7, 33 U.S.C. §§ 466-466K (1965).
5. *Cal. Water Code* § *13000.1* (West Supp. 1968).

maintain the health, safety and welfare of the people, for water wrangles are very bitter. Facetiousness aside, however, it is notable that both water permits and licenses for the disposal of wastes shall be regulated to maintain high quality.

When the California Water Quality Control Board considered the standards it would adopt for the Delta, the Department of Water Resources took a firm position against one criterion that was being considered. To adopt too high a standard for the control of salinity, it was successfully contended, would tend to disrupt water projects already adopted. If the United States Department of the Interior, which reviews these actions, attempts to reinstate the criterion that was omitted by the Board, one of its agencies, the Bureau of Reclamation, may occupy before the Department of which it is a part, the position the Department of Water Resources took before the State Water Quality Control Board, for otherwise the Bureau's operation of Shasta Lake and the Central Valley Project diversions may be rendered vulnerable.

In other words, a new skirmish has already occurred and another may be in prospect in the Battle of the Twenty-First Century. Acceptable water quality, when salinity is used as a measure, cannot be maintained in the Delta without conflict with surface water storage and diversion projects of utmost importance to the state. It is not pollution, as ordinarily described, that is causing deep concern in California. The nine Regional Water Quality Control Boards generally have kept the overt waste disposers in check in recent years as urbanization and industrialization has proceeded in the state. The waters are safe for the health of man and beast. It is the subtle changes wrought by use and reuse of limited water supplies that is the problem in California, changes that are measured in the laboratories in the mineral content of the remaining water.

There apparently is a way of restoring the balance, of course, without curtailing the water resources developments of the present era upon which the wealth of the state today is founded. I am not predicting that laws will be urged that will stop farming as hydraulic mining was halted in the interests of preserving the rivers. There are some hints of far reaching action against the use of pesticides in agriculture that leave a permanent residue and damage the aquatic environment as the slickens changed the valley. The balance can be restored by developing more water through additional projects and using this additional water to maintain low-flows above the critical levels. These increased flows thus can prevent the buildup of the minerals in the residual waters to intolerable levels. The old saw about dilution being the solution of pollution would then be raised

to the grand scale of whole river systems! Already, there are conservation voices being raised against this alternative. The Izaak Walton League, for example, has argued that "pollution should be rolled back" instead of placing additional water in the streams.[6] Indeed, if pollution is used to mean the dumping of materials from sewers and the by-passing of treatment plants, it should be held back. If persistent poisons cannot be replaced by degradable pesticides, restrictions of their use will be required regardless of the effect on agricultural production. It is, however, the subtle degradations that are the result of occupying our river basins that needs must be carried away, and which will cry insistently for low-flow augmentations.

The federal government has already taken a necessary step toward the grand-scale dilution of river basins through authorizing the Bureau and the Corps of Engineers to include low-flow maintenance among the purpose of their future water projects.[7] Neither California nor any other state, has taken any parallel action with regard to state water projects. Perhaps, like flood control, low-flow maintenance will become largely a federal responsibility with the costs, which unquestionably will be high, borne by the taxpayers. There are difficult grey areas of policy determination, however, that the states may not wish to resign wholly to the federal government. These treat with such determinations as when a problem of low-flow maintenance, requiring a nonreimbursable project to correct it, has been caused by the admission under local regulation of more wastes than can be assimilated by the receiving waters rather than by other more general forces. The extension of federal control might be feared in instances when the local control was deemed by the federal agencies to have been inadequate or ineffective. California has had the principle of regional, i.e., local control of water pollution so ingrained in its whole water program that the state, at least, will be inclined to avoid, if it can, control by the federal government of the acts of local bodies in pollution abatement. Any control of the Regional Boards, consistently has been denied even the state government itself in California. Avoidance of the danger of federal control quite likely will involve state participation in the program of the low-flow maintenance and in the projects that will be needed to provide the additional water. This is a field of activity, it can be seen, that will demand much public attention in the future.

In a lecture at the Davis campus of the University of California recently, I traced the development of the quality-quantity conflict on

6. *Izaak Walton League Bull.* (Spring 1967).
7. Flood Control Act of 1958, 33 U.S.C. § 701b-8a (1958).

the Colorado River as the classic example. I am sure that had more of my experience been in connection with rivers of the Midwest and East, I could have found interesting case histories to relate among them; the Delaware, the Potomac, the Ohio or some of the Ohio tributaries come to mind. The problem is not regional, in any such manner as aridity and its concomitant, the necessity to irrigate farmlands, is a unique problem of the West. Nevertheless, though it may give my presentation an unbalanced western aspect, a review of the situation of the Colorado River follows.

Development of the use of the waters of the Colorado River has proceeded rapidly in the midst of great controversy. No other river in the United States equals the Colorado in the degree of its importance to its own basin. Draining parts of seven states, it is the greatest river wholly within the arid zone of the United States.

When settlement of the Colorado River Basin began in the latter part of the 19th Century, the newcomers were altogether dependent on irrigation. Despite the fact that the basin is vast and the river's annual flow is more limited in proportion to the land area than any other of our great streams, there are more water projects that divert from the Colorado River watershed into other adjacent basins than there are from any other United States watershed. This rather ironic development, though historically it may seem logical, increases the aridity of the Colorado River Basin. Such diversions are defended by Colorado water users no matter in which state they reside as being compatible with the "law of the river."

Many of the diversions of Colorado River water into other basins are made near the headwater at elevations where they involve high quality water, of which the Colorado River Basin downstream has then a diminished amount. The remaining waters of the Colorado River are used and re-used. They are stored in a succession of reservoirs and their mineral content is concentrated as the result of evaporation from the surfaces. The waters wash the shores and banks and they receive the wastes of towns and the irrigation return from the agriculture in much of the basin. The waters gradually deteriorate in quality.

At the diversion point of the Colorado River Aqueduct of the Metropolitan Water District of Southern California on the west bank of Lake Havasu above Parker Dam, the water is hard and the mineral content exceeds the United States Public Health Service recommended drinking water standards. At the Imperial Dam near the Mexican border, where water is diverted for the Yuma, the Wellton-Mohawk, and the Gila Projects and the Imperial and Coachella Valleys, the mineral content frequently approaches 800

parts per million, even less acceptable as drinking water, though many residents of the project areas use it for that purpose. At Morelos Dam, below the Wellton-Mohawk and Yuma drains, the water diverted into the Mexicali Valley became so poor that Mexican farmers once refused to accept it, creating international contention.

The Colorado River Compact of 1922, upon which the division of waters between the upper and the lower basins of the Colorado River rests, deals only in quantity of water. Other succeeding agreements, stipulations, water filings, and court decrees that go into the make-up of "the law of the river" omit considerations of quality. The Mexican Water Treaty which became effective November 27, 1945, limited the annual entitlement of the Mexicali Valley farmers and water users to 1.5 million acre-feet of water from the Colorado River. In the debates in the United States Senate, the deliveries were described as being "wet water." In the Mexican Senate, however, it was explained that the deliveries were to be of waters of usable quality.

The reason that the water at Morelos Dam fell to such low quality on the occasion referred to was that the groundwater basin under the Wellton-Mohawk Poject in the lower Gila Valley was being partially evacuated of highly saline waters through the operation of a series of drainage pumps. This pumped, drainage water was returned to the Colorado River below Imperial Dam. The Bureau of Reclamation contended that the quality of water reaching Morelos Dam, the only diversion below the discharge, was monitored and never became worse than tolerable levels for irrigation. The drain water, it was contended, made up a part of the Mexican entitlement. The Mexicans said the water that they got stunted their winter wheat and salted their lands at an alarming rate. Investigators pointed out that the Mexican farmers were not following safe irrigation practices within their area, but were spreading their supply of water too thinly and not providing drainage to maintain proper salt balance in the soils of the lands that they irrigated. The Mexicans rioted and threatened to appeal to the World Court at the Hague for relief. The United States Department of State interceded. The Wellton-Mohawk drainage pumping schedule was revised. A drain canal to carry Wellton-Mohawk waste waters to a discharge point below Morelos Dam was hastily constructed by the Bureau. During periods of low releases from Lake Mead, the salty drainage water is discharged through the new ditch below the point of the Mexican diversion. Since 1961, this saline discharge has been the only water from the Colorado River reaching the Gulf of California, so completely is the river controlled by its great

dams and reservoirs and so fully is the flow utilized by the many projects that the river supports. The filling of Lake Powell created by Glen Canyon Dam, of course, has placed an unusual requirement on the river during this period.

The Imperial and Coachella Valley water users, unlike their Mexican neighbors, have worked out very exacting irrigation formulae to maintain a tolerable salt balance in the root zone of their crops. The districts that operate the irrigation systems have provided trunk drains to the Salton Sea. The landowners have tile-drained hundreds of thousands of acres of the farmlands in these valleys. The irrigation practice is to apply more water as the mineral content in the irrigation supply increases so as to flush the salts through the soils. Cultural practices, quite intricate, have been devised for various crops so as to avoid concentration of alkali at the points where the plants are growing, but to cause it to occur at other points on the ridges. After harvest, the ridges are broken down and the accumulated excess salts are again flushed by heavy application of water.

The method involving these intricacies may seem precariously complex, but the irrigators get record crops at harvest. A satisfactory balance of salt input and salt discharges has been maintained and some areas formerly unproductive because of alkali have been restored to use through the method.

Under the "law of the river," exact quantitative limitations are placed on allowable diversions from the Colorado River though they may not be enforced until shortages occur or full use is attained in the future. The limitations are based on criteria in the Imperial Valley, for example, reflecting the quantity of water beneficially used in the year 1929. Since in 1929, the quality of the water was better than it is today, the quantity used in that year will not irrigate so many acres today. The work the water does in growing crops is not so efficient because of deterioration of quality. Clearly, then, the lower the quality the less the water is worth.

Water users in California so far have contended they are satisfied so long as they get their allotted number of acre-feet. The time may come, however, when they may be forced to join the Mexican irrigators in protesting poor quality water.

What is the solution to this problem as revealed in the review of the Colorado River record? Augmentation of the flow of the Colorado River with water of satisfactory quality is the solution as has been pointed out by the water users of the seven basin states.[8] The Colorado could be supplemented by diversion from

8. Colorado River Water Users Association, Report of meeting on Jan. 13, 1967.

other watersheds that have ample supplies, though suggestions along this line have drawn political fire from the Pacific Northwest.

Desalination might provide a supplement. The techniques of desalting are known, but the costs presently are prohibitively high for general use. Irrigators could not pay for supplementation of the flow of the river through either method, even with the high value of crops produced in the Imperial and Coachella Valleys.

The problem of protecting the quality of the waters of the Colorado River within tolerable limits for irrigated crops seems certain in the future to shape the water projects that will serve the vast and important seven state basin.

Arizona pressed for authorization of a project she sorely needed to divert what she believes to be her share of the Colorado's remaining water into the central part of the state. California was fearful that the construction of the project will threaten further curtailment of diversions that are already provided for, and objected until certain guarantees were included in the authorization. This may hasten the day when augmentation of the flow of the Colorado River will become essential.

Difficult alternatives are presented. The crisis is upon the Colorado River Basin. It is already locked in battle in a contest that has spread to include the Columbia Basin as well, a fight that may rage for decades unless the facts are faced and cool heads gain control.

The facts are that quality considered, there is already a shortage of water in the Colorado River, and in many other streams, eastern as well as western, in the United States.

Waste discharges, therefore, must be cleaned up. Even after all practicable cleanup, however, in an increasing number of streams—specifically in the Sacramento-San Joaquin Delta and the Colorado River, but in others as well—water quality deterioration cannot be held above tolerable health, esthetic and agricultural limits except by augmentation of low-flow.

There may be a temptation to think the water quality people cry "wolf" when no threat is in sight. After all, people are drinking water that does not meet Public Health Service standards in hundreds of communities in the United States. The fact is, however, that the water will continue to degrade with intensified use brought about by increasing population. Although the standards may with impunity be blinked at for a time, there is a limit of tolerance.

Read what Dr. M. G. Candau, Director-General of the World Health Organization, said about water quality at the Water For

Peace Conference in Washington, D.C. recently. (He had reviewed the situation with regard to water-borne diseases.)

> In addition to all these is the growing threat to health due to the degradation of our water sources by man's own action. Expanding populations, industrialization and urbanization make it continuously more difficult to separate our wastes from our drinking water . . . wastes from increasingly sophisticated chemical processes are discharged from factories, and find their way into rivers, lakes, underground reservoirs and marine coastal waters, causing grave concern as to the public health, economic and aesthetic consequences of these pollutants.
>
> [M]ajor efforts are required to prevent man's environment from becoming hostile to his well-being and, indeed, to his survival. Conversely, well conceived planning for the optimum development of that environment will redound to man's physical, economic and social well-being. Of all the environmental factors, I believe that his water supply has the greatest and most immediate effect on his health, comfort and general well-being.[9]

Pessimism has no place among those considering water problems. Certainly the waters needed for all our purposes, including quality maintenance, are provided by nature. California has demonstrated with its State Water Project that the waters can be successfully taken from where they exist in plenty to where they are needed, mountain, plain or desert notwithstanding. Exactly what needs to be done about the available water supplies is known. The absent factors are the popular determination to take action and the action programs that will follow when the people will them.

The facts, as I see them, are that there is present a crisis in water. This crisis is engendering conflicts that, unless they are resolved through timely action, will break out into increasingly bitter contests as the population increases and the needs for water intensify. To all other programs of water supply and quality control must be added one more, a program designed to work out practicable means of augmenting the low-flow of many streams. Planning for interbasin transfers of water for the purpose of low-flow maintenance is sorely needed. Regardless of the fact that some interest will fear and oppose the very thought of transfer of excess water from one basin to another where the water is needed, this solution should be examined and discussed, because it is a likely solution and the only solution that is clearly in the realm of practicality at this time.

9. Speech before the Water for Peace Conference, Washington, D.C.