

hundred years. Ralph M. Parsons Inc., Los Angeles, Calif., 22 p.  
Stilwell, H. 1962. What happens when the rivers stop flowing? *Field Stream* 66(10):29, 65, 125-129.  
U.S. Fish and Wildlife Service. 1950. A preliminary evaluation report on the fish and wildlife resources affected by the proposed Truckee River Project, California and Ne-

vada. U.S. Fish Wildl. Serv., Portland, Oreg., 31 p.  
\_\_\_\_\_. 1958. A preliminary report on fish and wildlife resources affected by San Joaquin River Flood Control Project, California. U.S. Fish Wildl. Serv., Portland, Oreg., 23 p.  
\_\_\_\_\_. 1959. Effects of mine-waste pollution on anadromous and resident fish in

upper Sacramento River, Shasta County, California. U.S. Fish Wildl. Serv., Portland, Oreg., 14 p.  
\_\_\_\_\_. 1973. Threatened wildlife of the United States. U.S. Fish Wildl. Serv., Wash., D.C. Resour. Publ. 114.  
Warren, C. E. 1971. Biology and water pollution control. W. B. Saunders Co., Philadelphia, Pa., 434 p.

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## Concluding Remarks

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Many types of situations adversely affecting aquatic biota in the region bordering the northeastern Pacific Ocean may already be of a serious nature, if not in the future. In considering these matters here in a preliminary way, we can divide such problems into two categories: 1) those based upon physical changes; and 2) those arising as a result of chemical action.

Under physical types of activities causing potential problems are two industrial activities of great importance to the region under consideration. Diversion of waters has already been carried out to a greater extent here than in any other part of the country. We can certainly see that such activity has, even during the past several decades, resulted in very serious inroads into anadromous species of fish, especially salmon. A second physical type of alteration is the change in water temperature brought about by using water as a means for cooling in industrial operations. Such a change is, of course, of greatest concern for installations located either on rivers and streams or on enclosed marine bodies of water. Where volumes of water available to serve as the coolant are restricted, a considerable

rise in temperature of water can occur. The use of water as a coolant will, in all probability, increase tremendously in the next few decades in connection with the installation of thermonuclear electrical generating plants. With a preponderance of electrical power having been generated in northwestern North America by hydroelectric means in the past, the problems connected with raising water temperatures from electric power developments have been of less significance in this region than elsewhere in the country. They will, however, certainly become a major consideration in the near future.

Potential problems based upon chemical activity of pollutants entering waters can stem from a variety of sources including discharge of effluents from chemical manufacturing operations, uses of chemicals which may get into waters either from general industrial or agricultural and lumbering operations, discharge of raw or partially processed municipal sewage into waters, and accidental spillage of raw

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materials or chemicals during transport. These are the chief ways in which this class of pollutant can become problematical.

In the past, because the regions bordering the northeastern Pacific Ocean have had much lower population and less industrial and agricultural activity than most other areas of the country, these types of problems have, for the most part, been much less severe. In the future, buildup of populations and industry in the northwestern part of North America will increase such hazards. Especially, changing patterns in certain industrial operations such as the recent petroleum operations in Alaska could intensify these problems very rapidly in the near future.

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