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THERMAL POLLUTION IN THE COLUMBIA RIVER

By George R. Snyder
Fishery Biologist

Bureau of Commercial Fisheries
Biological Laboratory
2725 Montlake Boulevard East
Seattle, Washington 98102

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It would be better to have a strong opening sentence and paragraph to shake people up a bit, in this kind of an article. I tried one out - you can undoubtedly come up with something better.

Thermal pollution gravely threatens the sport and commercial fisheries of the Pacific Northwest. The danger increases progressively

Surface waters in the Pacific Northwest are being changed in noticeable and sometimes detrimental amounts through human actions. The trend is accelerating as rivers, lakes, and estuaries are turning into repositories for more and more waste heat from industrial and domestic sources or for and the warm water discharges from extensive long chains of reservoirs. Predictions on of ever increasing future demands for water warn us that corrective measures should must be designated now and implemented soon taken soon.

Thermal This pollution, or by excessive heat, is one among the most important environmental problems that man must resolve if he is to maintain the quality of his environment. Today, a major source of heat addition to the Columbia River is the Hanford Atomic Products Organization, which pours huge quantities of heated water are poured by that organization into the Columbia River just above Richland, Washington. where One result is the exposure of migrating fish could very well be exposed to lethal temperatures that may be lethal.

Future thermal increases in the aquatic environment will come from expansion of industrial water use, primarily by the thermal electrical power industry. Where and how this heat will be dispersed and what effect this these increased temperatures will impose on aquatic organisms are subjects of controversy.

Basically, a thermal electric plant converts heat energy from fuel (either fossil or nuclear) into electrical energy. The efficiency of this system today on a national average is only 32%--which means that for each unit of heat converted into electrical power, two units of waste heat are ejected into the environment.

The advent of the nuclear powered steam plant has magnified the problem of thermal pollution. Nuclear plants became competitive with fossil fuel plants in 1966. Because nuclear plants are less efficient, however, they must be larger than fossil fuel plants to be competitive. This results in a larger size which increases the amount of more heat being ejected into the environment through larger cooling water systems. The Bonneville Power Administration estimates projects that by 1987 an equivalent of twenty 1,000-megawatt thermal power plants will be in operation in the Pacific Northwest; a total of 9,000 megawatts will come from plants slated for siting on the Columbia River. About 1,400 cubic feet per second of water will be used utilized for every 1,000 megawatts of electricity produced by these plants. This water will be used to cool plant condensers and would will be discharged at temperatures up to 20° F warmer than surrounding river water unless it is otherwise cooled before discharge.

The most publicized aspect of the thermal pollution problem relates to the maintenance of a desirable type of environment for aquatic organisms. The problem in the lower Columbia can be traced directly to the proposed use of the river as a direct depository for huge quantities of waste heat. Attention has been focused on an area where two plants are proposed for siting: the Trojan plant at Prescott, Oregon, and the Kalama plant above Kalama, Washington.

Inconsistencies in water temperature standards set the stage for the initial controversy. Preliminary standards submitted for Federal review by Washington and Oregon pollution control agencies differed for the interstate waters of the lower Columbia River. The states agreed on an upper limit of 68° F. but differed on the increment of heat that could be added to the river throughout the year.

In 1968, the Secretary of the Interior directed the initiation of a thermal-effects study on the lower Columbia River to define the specific thermal limits of valuable stocks of anadromous fish--fish that live in the sea and spawn in rivers. The temperature criteria of those fish, when known, would be used to establish meaningful standards that could be adopted by both states to protect the fisheries. ~~The results from~~ this study ~~will be available for review upon completion~~ is expected to be completed in September 1970.

However, the establishment of uniform standards between states is only part of the problem. The best standards, when adopted, still do not apply to the water temperature at the end of the discharge pipe but to an area (~~distance~~ dimensions not yet determined) downstream from the pipe. Even if the temperature standards are rigidly complied with several miles downstream from the discharge pipe, the temperature in the area immediately outside the pipe mouth could ~~contain temperatures that are~~ be lethal to fish. This aspect is extremely important in a river, where fish, ~~of necessity,~~ must pass upstream and downstream. The problem is perhaps most acute in relation to with young downstream migrants that could might be swept into the lethal temperature zone and injured or killed before they could detect a change and escape. ~~these fish could be injured or killed before they could escape.~~

Control of river flow through upriver storage, and flow reversals due to tidal action, can further complicate the problem of potential heat discharges in the lower river. Upriver storage of water will result in a sizable reduction of peak river flow and lower minimum flows for some critical periods of fish migration.

Low flow complicates the problem of heat dispersal by decreasing the dilution factor, ~~discharged heat could have more effect~~ and thus intensifying the effect of the discharged heat on total river temperatures ~~at one time than at another~~. The reversal of flow, characteristic of the lower Columbia River, could occur ~~with~~ more frequently as a result of these reduced volumes of water in the river. Reversing flow could double or even triple the effect of temperature increases from a single source. The interaction of low flow and reversing flow at a thermal plant discharge area could seriously affect the success of fish migrations.

The facts concerning the effect of hot water on valuable species of Columbia River fish such as salmon, trout, sturgeon, and smelt are all quite clear to conservationists; these species require a subarctic type of environment. They have evolved in cold water and simply cease to exist in the presence of high temperatures, ~~changes, they simply fail to exist~~ die.

Evaluation of thermal electric plant development in the lower Columbia River is critical with respect to our present fisheries, for through this section of the river all migrant fish must pass. Adult fish are bound for their natal streams in Washington, Oregon, and Idaho, and whereas the young are headed for the Pacific Ocean. Although developers of the Trojan plant have announced their intentions to protect the fisheries resources by ~~through the installation of~~ using a cooling tower, the developers of the Kalama plant have not indicated that cooling towers would be included at the proposed facility.

Thermal pollution can be controlled and should be ~~prevented~~. A giant step ~~could~~ would be taken towards the solution of the problem if standards, once established, ~~could be~~ were applied to discharges at the end of the pipe, not after complete mixing in the river. This would necessitate the installation of off-river cooling facilities at freshwater thermal plant sites.

In the past, industries were not confronted with restrictions ~~concerning~~ on the disposal of waste heat to the aquatic environment. Heat ~~disposal~~ rejection was once considered a "proper use" of our waterways. Recently, however, a strong awareness and concern about the present level and ~~the~~ its potential expansion of thermal pollution has been expressed by the public and by State and Federal water resource agencies. The ~~disposal~~ indiscriminate disposal of heat into the aquatic environment must be stopped. We can only hope that the specter of thermal pollution will be recognized in time to apply existing technology ~~for~~ to the solution of the problem.