Hydro Québec Production

SUMMARY

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Abstract :
An environmental monitoring program was established to evaluate the physical, chemical and biological changes in the modified environments of the La Grande hydroelectric complex, to optimize remedial measures and reservoir management, and to improve impact prediction methods for future projects. In this context, water quality was monitored from 1978 to 2000 in the water bodies modified by the phase I of the complex. The objectives of this monitoring program were fully achieved. The causes, the extent and the duration of the changes in water quality of the various modified environments were well documented.

In reservoirs, leaching of flooded soils, decomposition of submerged organic matter and gradual replacement of the original waters by those of the rivers feeding them are the main processes modifying water quality. They resulted in a decrease of dissolved oxygen and pH, as well as an increase in ion, nutrient and phytoplankton concentrations. In the productive layers of reservoirs, the magnitude of these modifications was low and their duration relatively short. The minor permanent modifications are related to the replacement of waters and the new lake-like conditions. **In reduced flow rivers**, the main modification processes are the physical and chemical properties of the tributaries, the decrease in water level and turbulence, the presence of clay and silt along the new shorelines, as well as the increase in water residence time. In the reduced flow reaches of the Eastmain and Opinaca rivers, and of the La Grande River during the impoundment of the Robert-Bourassa Reservoir, these processes decreased dissolved oxygen content and water transparency and increased turbidity, degree of mineralization, organic matter content, nutrient content, and phytoplankton biomass. **Downstream of reservoirs**, water quality depended mostly on the properties of reservoir outflows. However, oxygenation and pH levels were re-established by water turbulence in rapids or in spillways, thus reversing part the modifications observed in reservoirs.

The results of the monitoring program led to improved prediction tools by the development of water quality change indicators relating the physical characteristics of reservoirs with the observed changes. In all modified environments, water quality remained adequate for aquatic life, and increased nutrient content had positive impacts on the whole food chain, up to fishes. In addition, water quality has stabilized in all the modified environments, and in many cases, is the same as in pre-development conditions. For these reasons, it is recommended to end water quality monitoring in the La Grande complex.

Key words : Water Quality/Environmental monitoring program/La Grande hydroelectric complex/Québec/James Bay/reservoir/increased flow waterbody/reduced flow waterbody.

Distribution list : Cree Regional Authority, Cree Board of Health and Social Services sociaux of James Bay, Makivik Corporation, Environment Canada, ministère du Développement Durable, de l'Environnement et des Parcs du Québec, Fisheries and Oceans Canada, Canadian Electricity Association, canadian electricity companies, James Bay Advisory Committee on the environment, Société d'énergie de la Baie James.

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