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Executive Summary

An environmental monitoring program was established to evaluate the physical, chemical and biological changes caused by the development of the La Grande hydroelectric complex. Monitoring of fish mercury levels became a regular component of this program as soon as the increase in fish mercury levels was observed. The specific objectives of the mercury monitoring were to evaluate the temporal evolution of the phenomenon in the different types of modified environments, inform fish consumers and improve impact prediction methods for future projects.

The main goals of the monitoring of fish mercury levels at the La Grande complex were all achieved. The monitoring clearly established the extent and duration of the phenomenon, the main processes involved, and the physical and biological regulating factors. Reservoir impoundment caused significant increases in fish mercury levels in reservoirs and water bodies downstream from them, by factors that generally ranged from 3 to 7 relative to levels measured in natural environments. The phenomenon was temporary, however, as levels in non-piscivorous species generally returned to typical baseline values found in natural environments 10 to 20 years after impoundment. In piscivorous species, this return should be complete after 20 to 30 years. The Québec Crees were consistently informed of fish mercury levels at the La Grande complex under the terms of the Mercury Agreement (1986) signed by the Crees of Québec, the Québec government, SEBJ and Hydro-Québec. Fish consumption guidelines for the La Grande complex were produced on the basis of exposure criteria established by the Cree Board of Health and Social Services of James Bay, using data collected during the monitoring. Anglers were also kept informed of fish mercury levels at the La Grande complex, as the monitoring data were regularly incorporated into Québec's freshwater sport fish consumption guidelines. The development of two prediction models for fish mercury levels in reservoirs clearly demonstrates that the third objective, which was to improve impact prediction methods for future projects, was fulfilled.

Since it proved impossible to use mitigation measures to reduce fish mercury levels, compensation measures were implemented, under the terms of the Mercury Agreement (1986), covering the harvesting of fish and other wildlife resources low in mercury. These measures helped reduce the Crees' mercury exposure while encouraging their traditional hunting and fishing activities.

Keywords:

Mercury; fish; hydroelectric complex; La Grande; Québec; James Bay; reservoir; reduced-flow environment; increased-flow environment; polynomial regression; northern pike; walleye; lake whitefish; longnose sucker.

Distribution List:

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