Preventing Mercury Contamination in the Boreal Forest: Summary of Concerns

Submitted on behalf of CPAWS Wildlands League

In support of an Application for Review
Section 61, *Environmental Bill of Rights, 1993*

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Preventing Mercury Contamination in the Boreal Forest: Summary of Concerns

Introduction: Environmental Incidence and Harm of Mercury

Mercury is ubiquitous in the environment even in the absence of local mercury sources. Best estimates to date suggest that human activities have about doubled or tripled the amount of mercury in the atmosphere, and the atmospheric burden is increasing by about 1.5 percent per year.[1]

There are natural emissions of mercury. However, more than half of the mercury that cycle through global ecosystems is attributable to human activities including, but not limited to, the burning of coal, mining and incinerating of waste.[2]

Mercury is naturally present in coal and is released into the atmosphere as an air pollutant when coal is burned. Coal fired generating stations alone produce about 40% of the mercury emitted in North America and the concept of "clean coal" is still a long way off and cost-prohibitive. Burning coal takes mercury that was locked into the coal structure and thus largely unavailable and disperses it into the environment. Smelters, cement kilns and other industries such as chemical plants and pulp mills also emit mercury. Historically, vast amounts of mercury were released by artisanal gold mining operations in Canada where it was used to extract gold.[3]

Mercury can travel airborne across vast distances before being deposited by deposition or precipitation. Mercury is emitted from the industrial stacks of coal fired power plants, smelters and other industries in various forms, some forms have a tendency to be deposited locally while other forms will travel in the atmosphere great distances before depositing on a regional or global scale. The atmosphere is the most important pathway for worldwide dispersion and transport of mercury.[4]

In addition to being directly discharged from anthropogenic sources, mercury concentrations are increased in soils and aquatic environments due to long range atmospheric transport and local weathering of the earth's crust.[5] With the exception of isolated cases of point source releases of mercury, the dominant source of mercury into the environment is via deposition from air.

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[1] Mercury Contamination of Aquatic Ecosystems. US Geological Survey. <http://water.usgs.gov/wid/FS_216-95/FS_216-95.html>

[2] Pollution Probe. 2003. Mercury in the Environment: A Primer. Toronto, Ontario.

[3] Appleton. D. et al. 2006. The GEF/UNDP/UNIDO Global Mercury Project – Environmental and Health Results from Small Scale Gold Mining Site in Tanzania. In: Dynamics of Mercury Pollution on Regional and Global Scales.

[4] Mason, R.P. 2006. Air Sea Exchange and Marine Boundary Layer Atmospheric Transformation of Mercury and their Importance in the Global Mercury Cycle In: Dynamics of Mercury Pollution on Regional and Global Scales.

[5] Bodaly, R.A. (Drew), and K. Kidd. 2004. Mercury Contamination of Lake Trout Ecosystems. Pages 147-158. *in* J.M Gunn, R.J. Steedman, and R.A. Ryder editors. Boreal Shield Watersheds: Lake trout ecosystems in a changing environment. CRC Press, Boca Raton, Florida.

Preventing Mercury Contamination in the Boreal Forest: Summary of Concerns

Once entered to a terrestrial system such as the Boreal Forest, mercury accumulates in forest soils and is slowly transported to surface and deep waters where it accumulates in biota and sediment. In aquatic ecosystems a portion of the mercury that is deposited or transported from the surrounding watershed transforms into methylmercury compounds which are readily taken up and bioaccumulate in the aquatic food chain.[6] The mechanism and sites for methyl mercury formation remain poorly defined.

It is only methyl mercury that is biomagnified in food chains leading to humans. Methyl mercury is highly toxic to human beings and wildlife, and poses significant environmental and health risks. Bodaly and Kidd describe methylmercury as a "powerful neurotoxin and in large doses causes motor, sensory and developmental problems in humans and other veterbrate animals."[7] Researcher David Browne describes just how problematic bioaccumulation is:

> As a result piscivorous fish such as pike, walleye, bass and trout obtain mercury from their prey and concentrate it in their muscle tissue at levels thousands of times higher than in the surrounding water.[8]

Mercury exposure has significant neurological and developmental effects on both human beings and wildlife, ranging from nerve damage to losses of sensory or cognitive ability, learning disabilities, birth defects, tremors, cerebral palsy, to death. Mercury can also lead to alterations to the immune system, liver degeneration, kidney toxicity and cardiovascular disease. Mercury affects the nervous, cardiac, immune and endocrine organ systems.[9]

Vulnerability to the effects of methylmercury, in particular, depends on age, as well as dose and duration of exposure. Methylmercury can be transferred via maternal breast milk and it readily crosses both the blood - brain barrier and the placenta[10], adversely affecting the developing fetal brain and at far lower exposures than the adult brain.[11] Because of these concerns, the Ministry of Environment stated that women of childbearing age, pregnant women, children, and populations that depend on fish as their primary source of food are most at risk.[12]

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[6] Mahaffey, K.R. 2006a. Where we Stand on Mercury Pollution and Its Health Effects on a Regional and Global Scale. In: Dynamics of Mercury Pollution on Regional and Global Scales

[7] Bodaly and Kidd (2004), op. cit., p.147.

[8] Browne, D.R. 2007. *Freshwater Fish in Ontario's Boreal: Status, Conservation and Potential Impacts of Development*. Wildlife Conservation Society Canada Conservation Report No. 2. Toronto, Ontario, Canada. p.50.

[9] Mahaffey, K.R. 2006a, op. cit..

[10] Health Canada. 2007. Human Health Risk Assessment of Mercury and Health Benefits of Fish Consumption. p.9.

[11] Mahaffey, K. R., 2006a, op. cit.

Preventing Mercury Contamination in the Boreal Forest: Summary of Concerns

The principle route of human exposure to methylmercury occurs through the consumption of contaminated fish and shellfish. Most of the mercury in fish is methylmercury. More than 95% of the methylmercury we consume in our diet is adsorbed and remains within our human body for months.[13] Approximately 13% of sport fish tested by the Ontario Government does not meet Health Canada guideline 0.5 ppm set to protect the general population from mercury in retail fish.[14] The level in prized fish such as walleye and northern pike is in general far greater. Although the Ministry of the Environment has monitored the level of mercury in fish across Ontario since the early 1970's there has been little feedback other than the book "Guide to Eating Fish in Ontario" available at the LCBO outlets to guide people on the wise consumption of fish. Particularly, there has been insufficient communication of the level of mercury in fish to First Nations communities so that they can assess the risks of eating fish.

Communities that rely on fish and wildlife for food, including Aboriginal peoples in Canada,[15] are usually at greatest risk, particularly women of child-bearing age, young children, and fetuses. Moreover, with respect to Aboriginal Peoples, a fundamental prerequisite to exercising the treaty right to take fish and wildlife is the existence of fish and wildlife that can be safely eaten. One of the paramount purposes of Treaty No. 9 was to preserve to the First Nations of the Nishnawbe Aski Nation the right to continue fishing and hunting as an economic and cultural way of life. The contamination of fish and wildlife with mercury threaten to make the treaty right to fish and hunt meaningless and valueless. Mercury contamination in Ontario is now threatening the treaty right to environmental protection.

A notorious case of mercury poisoning in Ontario is the Grassy Narrows and White Dog First Nations in Northwestern Ontario. The communities were poisoned after a pulp and paper mill contaminated the English-Wabigoon River system in the late 1960s and early 1970s. The plant has since closed but to this day, community members struggle with debilitating health problems as a result of the poisoning. Its health worries are exacerbated by the ongoing moblization of mercury as a result of clearcutting in its traditional territory.

The US Environmental Protection Agency states that the upper "safe" limit for blood mercury levels in human beings is 5.8 ug/l. Tests on Aboriginal peoples in Canada have shown blood mercury levels ranging up to 660 ug/l in areas where fish consumption is high. It has been found that 16% of people living in

[12] Minister of Environment. 2005. Ontario will reduce mercury emissions to air and water. August 26, 2005. http://www.ene.gov.on.ca/envision/news/2005/082601.pdf.
[13] Mahaffey, K.R. 2006b. Exposure to Mercury in the Americas. In: Dynamics of Mercury Pollution on Regional and Global Scales.
[14] Ontario Ministry of the Environment, *Sport Fish testing data August 04 – August 05* (unpublished).
[15] Arctic Council, 'Barrow Declaration on the Occasion of the Second Ministerial Meeting of the Arctic Council' (11 October 2000).

Preventing Mercury Contamination in the Boreal Forest: Summary of Concerns

Northern aboriginal communities have over 100 ug/l of mercury in their blood.[16] [17] [18]

It is common for lakes with lake trout populations in the Boreal Forest to have fish consumption guidelines. In fact, in Ontario 95% of the fish consumption advisories in lakes were related to mercury.[19]

Fish are no longer just considered a source of methylmercury, it is now understood that the methylmercury adversely impacts the fish causing reduced growth and reproduction.[20] Recent research also indicates that terrestrial animals, including forest songbirds, have increasingly dangerous levels of mercury.[21] Piscivorous (fish eating) predators such as loons, merganser ducks, osprey, eagles, herons, and kingfishers, also have very high concentrations of mercury.[22]

Browne notes that mercury accumulation in non-urban areas is highest in low relief landscapes with poor drainage and extensive wetlands.[23] The Boreal Forest, with its poorly drained areas and extensive wetlands (including one of the largest in the world), epitomizes this description. It would seem, therefore,

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[16] Ontario Public Health Association, "Position on Fish Consumption, with respect to Methylmercury Content, by Pregnant Women, Women of Childbearing Age and Young Children" (OPHA, 2004), at 22-23.

[17] There is historical data for people in Northern Ontario (far from any known sources of pollution) containing blood and hair mercury levels exceeding the recommended levels. It has been thought that the nutritional benefits of eating fish outweigh the risks but this assumption is without scientific justification. It is not enough to identify that people may already contain high levels of mercury but what relief is available. In fact, chelation therapy is now available. It is inexpensive and the risks are insignificant compared with the problems associated with elevated mercury. Individuals with high levels of mercury should be treated and followed to determine improvements. Certainly, existing levels of mercury result in some individuals exceeding levels which put them at risk. Activities which increase methyl mercury should be approached with caution (Dr. David Lean, personal communication. 2008).

[18] The Conference Declaration in the *Eighth International Conference on Mercury as a Global Pollutant* states that with respect to methylmercury and Omega- Fatty Acids that, "fish can contain both methylmercury and beneficial omega-3 fatty acids. Methylmercury exerts toxicity and can also diminish the beneficial healtheffects of omega-3 fatty acids. As with mercury, there are large variations in the level of omega-3 fatty acids in fish. Selection of fish species for consumption should seek to maximize the intake of beneficial fatty acids while limiting exposure to methylmercury." (p.4)
http://www.mercury2006.org/portals/31/Mercury2006_conferencedeclaration.pdf

[19] Bodaly and Kidd, 2004, op. cit.

[20] Mahaffey, K. R., 2006b, op. cit.

[21] See D.C. Evers, *Mercury Connections: The extent and effects of mercury pollution in northeastern North American* (Biodiversity Research Institute, 2005), at 3, and 14-18.

[22] Environment Canada. Mercury in the Environment.
<http://www.ec.gc.ca/MERCURY/EH/EN/eh-ec.cfm>.

[23] Browne, 2007, op. cit.

that industrial development (that results in flooding or draining of these wet landscapes or clearcutting) has a very high probability of releasing mercury into aquatic environments. This would be in addition to natural sources of mercury[24] and the impact of climate change on the mobilization of mercury due to drier conditions and increased temperatures.

Mercury is released and may become bioavailable in aquatic environments when:

- water levels are raised (i.e. flooding due to hydro development) an infamous example is the methylmercury contamination of fish that occurred in the James Bay area of Quebec due to hydroelectric developments impacting the local Cree communities;
- forests are clearcut;[25]
- water levels are lowered (as in the case of dewatering the muskeg or peat to access gems or minerals);[26] and,
- water chemistry is impacted, changes in dissolved oxygen levels or sulphate can impact methylmercury formation and mobilization (e.g., when water is taken form on source and released into another source causing a change of in the chemistry of the receiving water or when wastewater effluent discharge causes a change in the receiving water chemistry).

In 2003-2004, the Environmental Commissioner of Ontario (ECO) commented on the *Ecosystem Impacts of Mercury*. At the time, the ECO saw a,

> … need for a careful monitoring and clear public reporting of mercury's impacts on Ontario ecosystems, including impacts on higher trophic levels, vulnerable species an sensitive ecosystem functions.[27]

The ECO also recommended that MOE establish a comprehensive program to develop an understanding of the pathways, movement and fate of mercury in Ontario ecosystems.[28] It is unclear now how comprehensive and effective the

[24] Pollution Probe, 2003, op. cit., p.18.

[25] See Browne (2007), op. cit., page 49-51 for a description of the ways mercury levels are increased after forests are removed. Please also see Garcia E. and R. Carignan. 2005. Mercury Concentrations in Fish from Forest Harvesting and Fire-Impacted Canadian Boreal Lakes Compared Using Stable Isotopes of Nitrogen. Environmental Toxicology and Chemistry, Vol. 24, No. 3, pp. 685–693; and, Garcia E., R. Carignan and D.R.S. Lean. 2007. Seasonal and Inter-Annual Variations in Methyl Mercury Concentrations in Zooplankton from Boreal Lakes Impacted by Deforestation or Natural Forest Fires. Environmental Monitoring and Assessment. Vol. 131. No 1-3. pp 1-11.

[26] See letter from Dr. David Lean of University of Ottawa to Ontario Environment Minister in August 2007 with respect to the DeBeers Victor Diamond Mine Project.

[27] Environmental Commissioner of Ontario. 2004. 2003-2004 Annual Report. p.121

[28] Ibid., p.122

MOE's program can be given that it is still rebuilding after the cutbacks from the 1990s and that resources and staffing levels remain well below pre-1995 levels. MOE staff state, however, that one of its major initiatives with respect to mercury involves air and deposition monitoring sites set up at the University of Toronto in Mississauga, Point Petrie, and at the Dorset Environmental Science Centre. Deposition is not enough as revolatilization can also occur so NET deposition is rarely if ever monitored. Very few measurements have been made of methyl mercury in precipitation and this is likely the principal source to the food chain.

While these are important activities, the release of mercury into Boreal aquatic environments (as a result of forestry, mining and hydro development in addition to the burning of coal and processing of metals) is not being comprehensively monitored. This in turn means that environmental and health risks are being permitted to occur unchecked. And there appears to be no policy to prevent mercury contamination in the first place.

The mechanism for mercury being released

In a letter to the Minister of Environment from August 2007, Dr. David Lean, an ecotoxicology professor from the University of Ottawa explains the mechanism for mercury being released when water levels are altered:

> Overall, as you change water levels two things can happen. Both are regulated in part with changes in oxygen concentration in the water column and in the sediments. The first is well known in the construction of reservoirs where total and methyl mercury levels increase. The second condition exists when peatlands are partially drained and water being removed from the peatlands is also high in total and methyl mercury. The reason for this is less well known. I suspect that the high concentration of mercury contained in the organic horizon of the flooded soils is mobilized and this contributes to the increase. In addition, microbial respiration increases as the organic material is decomposed. This results in appropriate oxygen conditions for methyl mercury formation. The opposite effect of drying wetlands results in oxidation of reduced sulfide compounds that, in turn, contributes to elevated levels of sulfate. Mercury is now more mobile and not tied up as mercury sulfide and at the same time sulfate levels increase providing substrate for the sulfate reducing bacteria. These organisms are thought to play a major role in methyl mercury formation. It is only methyl mercury that is biomagnified in food chains leading to man and it is thought to be the more toxic form of mercury.

The former mechanism is important to consider in assessing hydro projects and clearcut logging. The latter mechanism described by Dr. Lean is especially relevant in the draining of wetlands in the Boreal Forest. It had been thought that only increasing water levels was problematic but recent work on wetlands

in Ontario confirms that reducing the water level of peatlands will increase export of methyl mercury to downstream locations.

The Ontario government is currently considering and approving mine projects located in the Hudson Bay Lowlands that require the draining of wetlands to access the gems and minerals. The DeBeers Victor Diamond Mine Project is the first mine project to be approved in the Hudson Bay Lowlands and the consequences of draining the muskeg, thereby releasing mercury, are only now beginning to be acknowledged (more than two years *after* it received environmental assessment coverage from the federal and provincial governments). This project is the first of many being proposed in the Boreal Forest. Furthermore, Ontario is in the middle of a nickel copper staking rush (east of the community of Webequie). And Platinex, a mineral exploration company is fighting an Aboriginal community, Kitchenuhmaykoosib Inninuwug in Northwestern Ontario. Ultimately, Platinex is setting the stage for a mine to be built to access platinum in KI's traditional territory. This would also necessitate the draining of wetlands and alteration of lakes and other water bodies which would have mercury pollution risks for the community. Enormous pressure will be coming in the next few years to access gems, minerals and metals. This will necessitate altering drainage patterns and dewatering the muskeg.

There appears to be a number of ways that industrial development in the Boreal Forest can lead to greater methylmercury contamination of fish and wildlife and humans that consume fish. These need to be examined comprehensively and cumulatively.

Current Regulatory Regime Provides Inadequate Protection for the Environment

The following summarizes the ways in which the regulatory regime has been inadequate to prevent the contamination and mobilization of mercury in the Boreal Forest and to prevent the significant associated health and environmental risks associated with the bioaccumulation of methylmercury in fish:

1. In the environmental assessment processes for the DeBeers Victor Diamond Mine Project, both federal and provincial governments overlooked the potential problem of methylmercury.[29]
2. Provincial authorities approved permits to take water in the Victor Project even though mercury contamination is now an acknowledged concern.

[29] CPAWS – Wildlands League and MiningWatch Canada, Application for Review of Lack of Environmental Assessment for Mining [excerpt].

Preventing Mercury Contamination in the Boreal Forest: Summary of Concerns

3. Conditions on permits to take water generally relate only to water quantity not mercury contamination and bioaccumulation of methylmercury in fish.
4. Current forest management practices do not take into account the potential effect of logging on the moblization and bioaccumulation of methylmercury in fish.[30]
5. Comprehensively monitoring of mercury being released into the environment and its associated risks is lacking.
6. Baseline data on levels of mercury in people in the Boreal Forest are not being monitored. Women of childbearing age, pregnant women, children, and populations that depend on fish as their primary source of food are most at risk.
7. Assessment of the human health impacts due to mercury exposure through fish consumption in Ontario's Boreal region is lacking.
8. Baseline data on existing mercury levels in wetlands and aquatic environments is not being collected and inputted into resource decision-making processes in the Boreal Forest.
9. Assessment of the impact on wildlife populations in Ontario's Boreal region due to exposure to mercury through their diets is lacking.
10. The province appears to lack an overarching policy and action plan to prevent mercury contamination in the first place.
11. The Ministry of Environment's belief that mercury is not an inherently toxic substance.[31]
12. The Ministry of Environment lacks the proper resources and staff to adequately carry out research to address society's poor understanding of the movement, transformation and bioaccumulation of mercury and its compounds and to conduct compliance and effectiveness monitoring, and enforcement. There are excellent researchers at the Dorset Research Location but through cutbacks in the last 15 years or more, their activity has been limited.
13. The Ministry of Environment's 'blue book' has an outdated water quality guideline for mercury (200ng/L).[32]
14. The Canadian Council of Ministers of the Environment (CCME) has water quality objectives that are much lower (than Ontario's) for concentrations of mercury (26ng/L for inorganic mercury and 4ng/L for methylmercury) but even the CCME acknowledges that 4ng/L for methylmercury may be too high to protect wildlife that consumes aquatic life.[33] For example, the level of methyl mercury in the St.

[30] Browne, 2007, op. cit.
[31] see p. 124 of the ECO's 2003-2004 Annual Report
[32] Ministry of Environment and Energy. 1994.
[33] Canadian Council of Ministers of the Environment. 2003. Canadian water quality guidelines for the protection of aquatic life: Inorganic mercury and methylmercury. In: Canadian environmental quality guidelines, 1999. Canadian Council of Ministers of the Environment, Winnipeg.

Lawrence River near Cornwall Ontario is less than 0.2 ng/L yet the walleye often exceed human consumption guidelines.

Under the *Ontario Water Resources Act* (OWRA), separate approvals are required for water withdrawals (permits to take water) and water discharges (certificates of approval). There is no legal requirement that permits to take water and certificates of approval for one project or operation be considered together in order to ensure the purpose of the OWRA "to provide for the conservation, protection and management of Ontario's waters and for their efficient and sustainable use, in order to promote Ontario's long-term environmental, social and economic well-being" (section 0.1) is achieved. For, example in some cases the purpose of the OWRA may be better served by requiring the reclamation of wastewater rather than approving new water takings.

Furthermore, the *Environmental Assessment Act* (EAA) is only triggered if a project is done by or on behalf of the Ontario Crown or other public bodies. Some publicly funded projects may be exempted from environmental assessment. Privately funded projects or operations would have to be designated through a regulation or an agreement in order to be required to undergo environmental assessment. Even when the EAA is triggered (be it a public or private project), there may be Class EA Approval(s) or Declaration Order(s) that do not require an overall assessment of the implications for water quality and quantity and/or limit the type of cumulative analysis in relation to other projects or operations within a watershed. For example, the Declaration Order respecting Forest Management Planning does not require forestry operations to consider impacts of the proposed timber harvest on the watershed. Rather, riparian zones are one of a series of guidance documents that need to be addressed under the regulated Forest Management Planning Manual. Despite the purpose of the *Crown Forest Sustainability Act,1994* "to provide for the sustainability of Crown forests and, in accordance with that objective, to manage Crown forests to meet social, economic and environmental needs of present and future generations" (section 1) where "sustainability" means long term Crown forest health (subsection 2(1)), consideration of the implications of harvest for water and how that relates to forest health is not a primary driver of the approval of forest operations.

When a substance is deemed to be inherently toxic then there is no need to consider the quantity and concentration of the discharge as well as the time frame over which the discharge took place. There is zero tolerance for discharge of inherently toxic substances (substances that by their nature cause impairment). If the material in a discharge is not inherently toxic, then it will be necessary to consider quantity, place, time etc… There is strong argument, based on ample scientific evidence, that mercury is indeed an inherently toxic substance for which a zero tolerance standard applies. The following are some

definitions used to describe inherently toxic substances and mercury would qualify under both of these definitions.

Definition from the federal government:
Inherently Toxic (iT) Chemical substances that are known or suspected, through laboratory and other studies, to have a harmful effect on human life or wildlife and the natural environment on which they depend.[34]

The province also has a definition in the new code titled Environmental Penalties – Code of Toxic Substances "Inherently Toxic to Humans: Those substances that are known or suspected of having harmful effects on humans, including cancer, birth defects and damage to genetic material."[35]

Water quality objectives/standards

There are two aspects of water quality objectives/standards that do not reflect the environmental and health risks of mercury. First, the mercury water quality guidelines set out by the Canadian Council of Ministers of the Environment (CCME) in 2003 appear to be too high to protect wildlife that consume aquatic wildlife. The water quality guideline (WQG) for freshwater aquatic life for inorganic mercury is 26 ng/L. For methylmercury it is 4 ng/L. The guidelines are intended to protect aquatic life. However, CCME acknowledges,

> The protocol does not address exposure through food or bioaccumulation to higher trophic levels. As such aquatic life that are exposed to methylmercury primarily through food (e.g., piscivorous fish) may not be adequately protected...Thus, if the ultimate management objective for mercury is to protect high trophic level aquatic life and/or those wildlife that prey on aquatic life, more stringent site specific application of these water quality guidelines may be necessary...[36]

Moreover, CCME warns environmental managers stating that water concentrations of methylmercury **below 0.007ng/L may be "required to protect all wildlife species in Canada"** while concentrations **above 0.2 ng/L may pose a risk to wildlife species**.[37] It appears that the national standard for methylmercury is too high.

In Ontario, official direction on how to manage the quality and quantity of both surface and ground waters comes from the 'blue book' titled *Water Management: policies, guidelines and provincial water quality objectives* of

[34] http://www.chemicalsubstanceschimiques.gc.ca/glossary-glossaire/index_e.html
[35] http://www.ene.gov.on.ca/en/about/penalties/ToxicSubstances.pdf
[36] CCME, (2003). p.1.
[37] CCME. (2003). p.5.

the Ministry of Environment and Energy (published in 1994 and reprinted in 1999). The Provincial Water Quality Objective (PWQO) for mercury is 0.2 micrograms/L **or equivalent to 200 ng/ L** (see Table 2 in Appendix A on p. 20). The supporting rationale for this objective comes from an MOE publication dated 1979. It is odd that this provincial objective is approximately 30 years old and inconsistent with the CCME guidelines.[38]

Summary Table: Canadian Council of Ministers of the Environment (CCME) and Ontario's Provincial Water Quality Guidelines for Mercury for the Protection of Aquatic Life.

	Aquatic Life (Freshwater)	Guideline value (ng/L)	Source
CCME	Inorganic Mercury	26	CCME [39]
	Methylmercury	4*	CCME [40]
Ontario	Mercury	200	Ministry of Environment's 'blue book'[41]

*CCME acknowledges that this may not protect wildlife that consume aquatic wildlife and that a methylmercury concentration of 0.007ng/L may be needed to protect all wildlife in Canada.

Second, the cumulative impact of existing level of contamination in the aquatic environment is not considered. For example, mercury concentrates in fish and there is no consideration of the existing level of contamination in the adjacent and downstream fish populations when decisions regarding the water quality of the effluent are made.

The Canada Wide Standard for mercury emissions from coal-fired power plants was endorsed by the CCME in October 2006[42] with targets including provincial caps starting in 2010 of 60-70% reductions. Despite these goals the Ontario Minister of Environment stated, before the CWS's adoption, that Ontario would be unable to meet its commitment due to its failure to close down the coal fired power plants as initially planned.[43] In the absence of this goal, Ontario is

[38] In practice, it seems provincial regulators (MOE) are also using the CCME quidelines when assessing the risks of methylmercury contamination. However, even the CCME cautions that these may be too high.
[39] CCME. (2003).
[40] Ibid.
[41] Ministry of Environment and Energy. 1994.
[42] See Canada-Wide Standards for Mercury Emissions from Coal-Fired Electric Power Generation Plants (11 October 2006), available at <http://www.ccme.ca/assets/pdf/hg_epg_cws_w_annex.pdf>.
[43] Robert Benzies, "Ontario reneges on its vow to cut emissions: Coal-fired plants to blame, sources say", *Toronto Star* (29 June 2006). See also "McGuinty's pollution pledge under new cloud: Agency's report urges further delays", *The Globe and Mail*, Wednesday, November 15,

without a policy to reduce mercury emission from industrial sources other than its delayed commitment to close down the coal fired power plants in the province by 2014.

Recommendations for Responding to Mercury Contamination in the Boreal Forest

1. An overarching policy and action plan to prevent mercury emissions and contamination in the first place;
2. Ongoing collection of data and monitoring of baseline levels of mercury in Boreal ecosystems with special attention to lands of Treaty No. 9 and 5;
3. Scientific review of the guidelines for methylmercury currently being used by the province to ensure all wildlife in Ontario are being protected;
4. A risk assessment on the potential for the release or mobilization of mercury (as a result of industrial development) in Boreal Forest ecosystems must be addressed in land use planning exercises as well as environment assessments of mining and other projects well before the permitting and certificates stage;
5. Monitoring of mercury levels in people in the Boreal Forest is needed (with special attention to women of childbearing age, pregnant women, children, and First Nation populations that depend on fish as their primary source of food);
6. Monitoring of mercury levels in the wildlife in the Boreal Forest is needed;
7. Forest management practices that take into account the potential effect of logging on mercury accumulation on fish;
8. Increased resources and staff to pre-1995 levels in the Ministry of Environment to support research on the movement of mercury, increased compliance and effectiveness monitoring, enforcement and to prevent mercury contamination in the first place;
9. Close Ontario's coal-fired power plants;
10. Ban the use of mercury in all consumer products and industrial processes where safe alternatives are available; and
11. Establish a recycling program to capture the mercury in used products such as florescent bulbs.

2006; "McGuinty shifts blame for broken vow on coal", *The Globe and Mail*, Thursday, November 16, 2006