

The Worst Environmental Disaster No One Has Heard Of:

The Coal Slurry Spill at Obed Mines

by Mark Poesch

What Happened?

On Halloween, at around 4:30 pm local time, the Obed Mine “Green Pit” water storage pit failed, releasing approximately 670,000 cubic metres of processed ‘coal slurry’ into the main tails pond causing a quick chain of events. The coal slurry/tailings mixture quickly toppled over the dam walls, entered into the emergency spillway and from there into Apetowun and Plante creeks, and finally into the Athabasca River. Helicopter flights by Environment and

Sustainable Resource Development (ESRD) staff began on November 1, 2013 (full data available online at <http://environment.alberta.ca/04252.html>).

The plume moved quickly initially, moving over a hundred kilometres in the first day alone. By November 15, the plume was 153 kilometres downstream of the town of Athabasca and was 178 kilometres in length (traveling at a speed of approximately 2.4 km/hr). A week later, the plume was located 56 kilometres upstream of Fort MacKay and 242 kilometres in length (traveling at 1.9 km/hr).

What are the potential impacts of the Obed Mine spill to humans, fish and wildlife?

Coal slurry is the byproduct of processing and cleaning coal. It is a thick, sludge-like mixture of water, sediment, coal waste particles, rock and clay. According to the most recent records, the Obed Mine tailings pond included phosphorous (64 tonnes), manganese (42 tonnes), arsenic (10,071 kg), lead (5,561 kg), cadmium (127 kg), mercury (66 kg) and phenanthrene (26 kg). See Environment Canada's National Pollutant Release Inventory at <http://www.ec.gc.ca/inrp-npri>.

There are several guidelines that are used by agencies to determine the toxicity and magnitude of spills. Maximum acceptable concentration (MAC) is a measure developed by Health Canada for the Canadian Drinking Water Guideline (<http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index-eng.php>). MAC is used to assess the risk to public health for potential consumption, and is among the most restrictive guidelines to assess water quality in Canada.



Coal slurry/sludge was sent down Apetowun and Planie Creeks into the Athabasca River, levelling trees and riparian over 30 metres wide for a span of 40+ kilometres and leaving behind more than 50 centimetres of coal slurry as sediment for several kilometres downstream. — Photo courtesy AESRD.

Contaminants such as arsenic were measured over nine times higher than MAC guidelines (10 micrograms per litre [ug/L]), peaking at 98.8 ug/L in the tailings plume. Lead measured over seven times higher than MAC guidelines (10ug/L) in the plume and remained above MAC levels for up to 228 kilometres downstream. Selenium levels were measured at 1.19 ug/L, exceeding MAC guidelines of 1 ug/L. Benzo[a]pyrene (and B[a]P TEQs), a polycyclic aromatic hydrocarbon, or PAH, was measured up to four times higher than MAC (0.01 ug/L), and were measured over 250 kilometres downstream at Fort Assiniboine. Heavy metals exceeded irrigation/livestock watering



Location of breach of the Green Pit tailings pond from Obed Mine located near Hinton, Alberta. More than 670,000 cubic metres of coal slurry/sludge was sent down Apetowun and Planie Creeks into the Athabasca River. — Photo courtesy of Google Image.

limits, including iron (6x), aluminum (8x), and manganese (13x), resulting in a closure of watering practices for livestock and irrigation.

The levels of contamination from the coal slurry and sediment have the potential for very serious impacts to human and/or biotic health. Many of these chemicals have been shown to have serious effects to human health and to the environment. Phenanthrene and benzopyrene, for example, are types of PAHs, a class of organic contaminants of which several are known as cancer causing agents. Although, the exact human health effects of PAHs like phenanthrene are unknown, the United States Environmental Protection Agency warns of potential effects, including a study which showed that exposing mice to 308 parts per million (ppm) for 10 days was sufficient to cause birth defects (<http://www.epa.gov/osw/hazard/wastemin/minimize/factshts/phenanth.pdf>).

Unfortunately, the spill couldn't have happened in a worse spot for fish in the province. The areas near Hinton, Alberta are among the most sensitive areas for fish species in the province. For example, this area is home to three fish species that are heavily sought after by anglers and undergoing dramatic declines, including bull trout (listed as "Threatened" in Alberta), Athabasca rainbow trout (listed as "Special Concern" in Alberta) and Arctic grayling (listed as "Special Concern").

According to the provincial status reports, 78% of bull trout core areas are considered to be at high risk, while there has been a decline of over 40% in Arctic grayling distribution relative to their historical Alberta range.

On the other hand, pure Athabasca rainbow trout are found in relatively few locations and remain one of the only native rainbow trout populations east of the continental divide.

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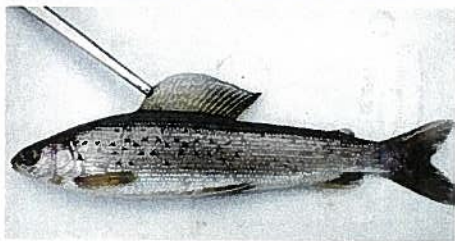


— Photo by W. Warnock

The location of the Obed Mine spill (near Hinton) is among the most sensitive areas for fisheries in Alberta. This area is home to three species that are highly sought after by anglers, including: bull trout (above), as well as Athabasca rainbow trout (below) and Arctic grayling (bottom).



— Photos by H. Nelson-Chorney and B. Neiland



Habitat loss from land-use impacts on each of these species has been identified as a major driver in reducing their population sizes. The sediment deposition is not only likely to impact spawning of these sensitive species, but the lethal and sub-lethal levels of contamination will take years, if not decades, to be fully understood and appreciated.

It should be noted that levels that exceeded MAC guidelines were measured early on and were lowered by the deposition of sediments and diffusion of the plume as it moved through Plante Creek and the Athabasca River. Although some might suggest that such measurements indicate that the plume moved quickly downstream, the impacts to the river are likely long lasting and significant. In particular, ESRD found more than 50 centimetres of fine sediments filled with various heavy metals and various other contaminants over 2 metres for hundreds of tens of kilometres downstream with hundreds of kilometres likely to be impacted (C. Cooke, pers. comm.).

The legacy of sediment deposition remain unknown, but given the extent and amount of contaminants in both the slurry and detected downstream, there remains a risk of continued degradation of water quality through release of contaminants from the sediments.

How bad was the spill?

To put the Obed Mine Spill into perspective, one of the worst coal mine spills in North American history was in Martin County, Kentucky in 2000, with a total release of 950,000 cubic metres of coal slurry. This spill was referred to as “one of the worst environmental disasters ever in the southeastern United States”. The result was over 400,000 dead fish and significant changes to 120 kilometres of rivers and streams, including turning parts of the river black. Interestingly, the United States Mine Safety and Health Administration (MSHA) rated coal-slurry impoundments across the country on their ‘breakthrough potential’ and classified 20% (45 of 225 ponds) as “high risk”, and 14% (32 of 255) as “moderate risk” of failure. In fact, the spill in Kentucky occurred at a site that was rated as ‘moderate’ risk and where a previous spill had occurred only six years earlier. As to the best of my knowledge, no equivalent Canadian data exists; this data represents the best available knowledge to assess the potential future spills. Given the rate of resource extraction occurring in the province, this data not only suggests a high likelihood of future spills of this magnitude, but also reemphasizes the importance of proper oversight.

What now?

The consequences of the Obed Mine spill to humans, fish and wildlife is only

beginning to be released and understood. The American Fisheries Society, the largest and oldest scientific body representing fish, has recently drafted a position paper on the impacts of oil and gas development on fish populations (Hughes, R.M. et al., 2014). In this paper, they recommend immediate and substantive changes to the ways in which North American governments conduct environmental assessments and permit, monitor, and regulation those mines.

Among the various recommendations presented, they: re-iterate the importance of public involvement in deciding appropriate use of land and water; that development should be responsible for protecting the environment in perpetuity; and that baseline research and monitoring should be conducted before and after development.

With the recent National Energy Board approval of the Northern Gateway pipeline and heightened political concerns regarding the Keystone pipeline, it is perhaps the most opportune time for Alberta to demonstrate the importance of environmental stewardship. If not, we must ask a fundamental question: if Canada’s worst coal slurry spill isn’t enough to cause action, what is? ■



Biography: Mark Poesch is an Assistant Professor at the University of Alberta. His research focuses on understanding the mechanisms related to the loss of aquatic

biodiversity. He is a member of the Freshwater Fishes Subcommittee of the Committee on the Status of Endangered Wildlife (COSEWIC), the national body that lists species at risk of extinction. He is also a member of the Scientific Subcommittee of Alberta’s Endangered Species Conservation Committee. Dr. Poesch was invited to participate on an expert panel to describe the impacts of the Obed Mine spill. The impacts described here summarize the findings of the symposium and the expert panel (<http://www.youtube.com/watch?v=mc2TvNa4x50&feature=youtu.be>).

References:

Hughes, R.M. et al. Position paper and AFS Policy Statement on Mining and Oil and Gas Extraction (2014 draft). American Fisheries Society, Bethesda, Maryland. Available online: http://fisheries.org/docs/wpl/POSITION_PAPER_FOR_DRAFT_AFS_MINING_POLICY_for_comment.pdf.