A Report on Mining Activities and Impacts in the Lake Superior Basin

Northwatch       Summer 2001
The Lake Superior basin is rich in minerals, and mining has played a key role in its settlement over the last century. On the Ontario side of the basin, there are currently 5 gold mines and one palladium mine in production. Hundreds of abandoned mines scattered throughout the area testify to historical production of a wide range of commodities. Exploration remains very attractive in the basin, primarily for gold, palladium group metals, and - increasingly - for diamonds.

Mining has both benefits and costs. Communities like Marathon, situated near the Hemlo gold mines, experience major economic benefits from the mines while they are in operation, including employment and local spending. But mines must inevitably close, either when reserves are exhausted or markets fall. It is predicted that the Hemlo mines will all shut down within the next 12 years.

The active mines on Canada’s Superior coast are among the country’s largest, including the rich gold mines of the Hemlo camp and the recently expanded palladium mine at Lac des Iles, north of Thunder Bay.

Throughout the Great Lakes Basin, mining has left a dismal legacy of contaminated sites and contaminated ground and surface water.

Mining is a fascinating and influential component of northern Ontario’s past, present and future. The industry is ever changing. It is now estimated that 3.4 employees are required to generate $1 million of metals production. As mechanization in mining increases, so too does the scale of its operations and its impacts.

This report examines mining in the context of environmental impacts to air, land and water, and considers community transition, First Nations issues, and worker health and safety underground. Many of the difficult issues and impacts identified in this report on mining in the Lake Superior basin are also relevant in other jurisdictions globally. This report was created to provide information on mining issues and impacts in the Lake Superior basin in the belief that increased public understanding of mining issues will lead to increased public oversight, which in turn will move mining in the direction of maximizing benefits and minimizing costs, particularly environmental and social.

Northwatch Hits the Mining Trail with the Lake Superior Mines and Metals Monitoring Project

In early 2000, Northwatch began developing an overview and inventory of mining activities and their impacts in the Lake Superior basin, as the first in what we hope will be a series, covering each of the major water sheds in northeastern Ontario. The Superior Mining Project (which identified a number of inferior mining practices!) included research about operating, abandoned and proposed mines on the Canadian side of the Lake Superior basin. The research was done through many visits to the Ministry of Northern Development and Mines offices and reading room, too many hours scanning industry data bases, web sites and news releases, and reviews of compliance data and reports of pollution releases from the federal and provincial government.

Finally, in June 2001, the Northwatch team hit the road, travelling up and down the Superior coast, visiting 16 mine sites, 3 First Nations, and a diamond laboratory, meeting with 1 municipal reeve, 1 trade union staff representative, 6 mining companies, and several Ministry of the Environment officials, and holding 2 community roundtables.

This tabloid is a product of that tour, as well as the many hours of research before and since. The project was made possible through the financial support of the Lake Superior Alliance and MiningWatch Canada, and the generous sharing of time, knowledge and understanding of many people along the way.

Founded in 1988, Northwatch is a coalition of environmental and social justice groups working to address environmental and social concerns related to natural resource use, particularly mining and logging, and other regional issues, such as toxic waste, the nuclear industries and waste disposal schemes, and air and water quality.

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The mining process requires massive removal of soil and rock to retrieve the valued ore. The result is huge amounts of wastes that often contain toxic heavy metals and acid-generating minerals.

The ore goes through a number of processes on its way from mine to market. The first of these is a primary separation of the desired mineral from the other constituents of the rock - a process which produces large quantities of contaminated water and huge volumes of waste rock and tailings. Tailings are fine ground rock which is created as a waste by-product of milling. The waste rock and tailings, when exposed to oxygen and water, may generate acidified drainage, which pollutes surface and ground water and area streams, rivers and lakes.

After the ore has been milled and made into a concentrate, it is smelted and refined to produce the desired metal. When metals occurring in sulphide minerals are smelted, sulphur dioxide is released. In addition to causing respiratory problems and having other harmful environmental effects, when sulfur dioxide is released into the air it mixes with precipitation to form acid rain.

A range of toxic heavy metals are also released to the air by smelting. Generally, these pollutants settle to the ground close to the smelter, contaminating local soil and water.

Algoma Steel’s Ore Division in Wawa closed in 1998 rather than make the investment needed to reduce their air emissions. They left behind a 40 kilometre “kill zone” caused by emissions from the sintering process. The town is now struggling to clean up arsenic-contaminated soils registering at 100 times more toxic than the federal government’s standard for acceptable risk.

Mining in Ontario is regulated through the Mining Act, the Environmental Protection Act and the Ontario Water Resources Act. The mission statement for the Ministry of Northern Development and Mines is “to generate new wealth and benefits for residents of Ontario by stimulating environmentally and economically sustainable use of the province’s geology and mineral resources.”

A look at mining in the Lake Superior Basin raises questions about how well the government is meeting its mission statement. Mining companies do not appear to have posted adequate financial securities for closure, thereby increasing public liability. Miners’ health is being put at risk by poor tracking of monitoring results and spotty standards. Planning for perpetual care is in legislation but not in practice. Groundwater contamination from mines is left unregulated and aquatic ecosystems are impaired by mine effluent. And First Nations are not being consulted and do not receive benefits from mines in their territories.
Exploring the Lake Superior Basin - the Search for Money-bearing Rock

Mineral exploration is on the rise in the Superior basin, with the number of “active properties” almost doubled from 1999 to 2000. Almost half of the exploration projects are gold prospects, with the platinum/palladium group following at just under one-third, and diamonds making up about 10%.

Every mine starts with a prospector driving stakes into the four corners of a parcel of land, tying his tag to the last post, and claiming the mineral rights. Then the earth is scratched, scraped and drilled in an industrial probe for her secret wealth of mineral, metals and gems. Along the way, the market intervenes, with much of the money that is being made in mining changing hands not as a result of mine production, but through the buying and selling of possibilities. Mine property prices rise and fall with the latest news of drill results, or investment shifts, and through mergers and acquisitions.

In Ontario today, money can be made in the business of looking for a mine. Mineral exploration is now heavily subsidized, through both direct grants to mining industry associations, government funded mineral reconnaissance and research, and flow-through shares, which provide tax benefits to those who invest in mineral exploration, regardless of whether a mine is ever found.

Last year, the provincial government announced $4 million in direct funding to help restructure the Ontario Prospectors Association. The OPA is an industry association whose mandate is to “meet the needs of the prospecting community” and “create and promote prospector development initiatives to support grassroots exploration”. Practically speaking, the primary role of the Ontario Prospectors Association is that of an industry lobby group, promoting the mineral exploration industry’s interests in provincial policy-making, and local land-use planning.

One of the largest areas of subsidy to the mineral exploration sector is in the direct funding by government of research and development for the mineral exploration business.

“Our $29-million Operation Treasure Hunt investment is generating new geoscientific data that promotes Ontario’s standing as one of the best jurisdictions in the world for mineral exploration,” said Ontario Mines Minister Dan Newman, in his July 31, 2001 news release. “It is part of the Mike Harris government’s ongoing support for the mining industry and it is one of the reasons Ontario was last year ranked by the Fraser Institute as the top jurisdiction in Canada – and number three in the world – for mineral potential and mining investment attractiveness.”

Work done by the Ontario Geological Survey under the “Operation Treasure Hunt” includes mineral studies looking at diamond potential in the Wawa area, with OGS staff members involved in a province wide evaluation of kimberlite, the rock type most likely to host diamonds. Ministry of Northern Development and Mines news releases boast of the diamond potential in the Wawa area, and seek credit for having first funded geological surveys in the areas currently being explored by the mineral industry.

A dozen different properties are being explored in the Wawa area. One company, Spider Resources, has a claim that is 200 square kilometres in size.

Diamond exploration usually involves removal of the overburden - all of the soil and plants above the bed-rock - as well as diamond drilling and removing large volumes of rock for bulk sampling.

<table>
<thead>
<tr>
<th>Five Stages of Mining</th>
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<tbody>
<tr>
<td>Preliminary Exploration and Staking</td>
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<tr>
<td>Geochronal and/or geophysical techniques used to identify valuable ore bodies. Ground-work, such as stripping or trenching to remove overburden and/or drilling are used to obtain samples.</td>
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<tr>
<td>Advanced Exploration and Development</td>
</tr>
<tr>
<td>Further exploration and feasibility studies examine profitability, design of the minesite is planned, and construction begins e.g. shaft sinking, pit excavation, road building, construction of surface facilities.</td>
</tr>
<tr>
<td>Mineral Extraction</td>
</tr>
<tr>
<td>Ore is removed from the ground. Waste rock is discarded and the remaining rock is transported to a mill. Ore can be extracted from open pits, from underground, or through heap leaching.</td>
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<tr>
<td>Concentration / Beneficiation</td>
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<tr>
<td>The ore is crushed and ground at the mill. This is followed by separation of valuable material from waste (tailings) using gravity, magnetic, or flotation techniques.</td>
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<tr>
<td>Further Processing</td>
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<tr>
<td>Further metallurgical processing, such as smelting, and refining is carried out, which may be done further off-site. This stage usually involves changes in the chemical nature of mined minerals.</td>
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“Operation Treasure Hunt ... is part of the Mike Harris government’s ongoing support for the mining industry”

Ontario Mines Minister Dan Newman

The publicly funded Ontario Geological Society lake sediment surveys have identified more than 75 “targets” for precious and base metals in three regions of northwestern Ontario, primarily in the Lake Superior basin. The helicopter supported lake sediment sampling for the Atikokan, Schreiber and Longlac regions identified enhanced levels of palladium, platinum, copper and nickel. Approximately 35 properties in these areas are now being explored, according to industry reports.

After more than a decade of development work, PolyMet Mining Corporation’s Marathon Palladium Project, 10 kilometres north of Marathon, is in advanced exploration. The current drill program is delineating the extent of the economic mineral reserve. The exploration company contracted to do the work is describing the deposit as “tailor made for open pit mining”, with high copper content boosting the financial appeal of the palladium mine.

PolyMet is currently projecting a 15 year mine life, expected to produce 949,00 oz of palladium, 267 million tonnes of copper, 215,000 oz of platinum, 146,000 oz of gold, and 1.7 oz of silver. Total capital cost is initially projected at $185.2 million CDN, and will generate $152.3 million CDN in profit.

Under the Canadian Environmental Assessment Act, an environmental review is required, with early notice to the public a central principle of the Act. No notice has yet been given, and the Canadian Environmental Assessment Agency has not yet been informed of the project by either the Company or the federal Department of Fisheries and Oceans, who will have a lead role in the review.

In 2000, the Province also announced a new four-year $8 million program to develop advanced technologies for mineral exploration. The fund will support research on new technologies that allow the mineral industry to look deeper into the earth’s surface to uncover new mineral deposits, including theoretical and laboratory research and “demonstration projects”, using the technology in the field.

Perhaps one of the most environmentally threatening of the Province’s financial incentives is the re-introduction of flow-through shares, a move that has been matched by the federal government. Cancelled in the early 90’s only to return in 2001, the program provides tax breaks for those who purchase a “flow-through share” in exploration.

The federal government provides a 15% tax credit, and the Province a 5% tax credit. Flow-through shares can fund prospecting, drilling, digging, trenching, surveys, food and lodging, and transportation of crew and equipment. In its past incarnation, the flow-through share program was recognized as being the cause of activity for activity’s sake, given that purchasing a flow-through share could provide, dollar-for-dollar, more tax relief than it cost. There has not yet been any assessment done of the new federal-provincial program, of either its effectiveness in stimulating new mine development, or the environmental effect of disturbing larger areas through mineral exploration.

Despite the flow of provincial dollars to boost the diamond, platinum and palladium prospects, gold is still the leader of the pack in terms of industry interests in the Superior basin. From Sault Ste. Marie to Quetico, the coast is littered with active or semi-active gold exploration sites, including a dozen in each of the Nipigon and Wawa areas, almost as many in each of Sault Ste. Marie and Marathon areas, and almost twice as many in the Thunder Bay Division, of which approximately half are estimated to be in the Superior basin.

At least one gold prospect, River Gold’s Mishi Pit between Wawa and White River, is moving into development. The Mishi Pit was initially described by River Gold Mines, the current owner, as being a 100,000 tonne per year operation with a projected life span of 4 to 5 years, but company officials more recently described it as “a seasonal operation” of just 30,000 to 40,000 tonnes, during a site visit by Northwatch. River Gold’s 2000 Annual Report estimates 450,000 tonnes at a grade of 3.1 grams of gold per tonne, to a depth of 35 metres. Production is expected to commence in 2002.
Water Pollution - Impacting Surface and Groundwater in the Lake Superior Basin

Mines impair aquatic ecosystems downstream of their operations. Permitted discharge levels for contaminants in mine effluent are set higher than the Provincial Water Quality Objectives for the protection of aquatic life. Chemicals used in processing (e.g. ammonia from explosives, cyanide for gold extraction, oils and greases) may be discharged, and exceedances may occur. If mine waste is acid generating, metals may be leached and contribute to increased metal loadings downstream, affecting the ecosystem into perpetuity. Groundwater can also become contaminated from mine waste and underground workings.

The Golden Giant Mine, owned by Newmont Mining Ltd. at Hemlo, meets permitted pollution limits at its discharge point in Lim Lake, at the mine’s property limit. However, effluent does not meet Provincial Water Quality Objectives until it reaches the confluence of Hayward Creek and the White River, over 20 km downstream from the point of discharge. When the mine was under development, it was predicted that the mining activity would impact water quality in Lim Lake. It is now apparent that water quality changes and biological effects further downstream have also occurred.

The Geco and Wilroy mines, owned by Noranda Minerals Inc. near Manitouwadge generate acidic runoff laced with heavy metals that must be treated in perpetuity. Metal loadings will steadily increase downstream over time. While significant reductions in zinc loadings are expected due to water treatment, even if reductions decline to the most optimistic forecasts, loadings will still be significant. For example, with a reduction in zinc loadings of 90% in Fox Creek (over 1993 levels), there will still be an annual rate of zinc loading of over three times background levels. Similarly, according to reports in 1995, Inco’s Shebandowan Mine west of Thunder Bay contributes nickel loadings from the minesite (including mine drainage and creeks on site) that are ten times higher than background inputs.

In some cases, there seems to be a perception on the part of either the regulators or the companies that there are lots of lakes and rivers in northern Ontario, so the pollution of some can be accommodated. For example, an assessment of the environmental effect of the Geco and Wilroy mines described the impacts on Mose Lake (over 100 ha in size) and on over 4.5 km of creekbed in Harry and Fox Creeks as “only very local”. However, zinc concentrations in the sediments exceed the province’s Severe Effect Level more than 15 km downstream from the mines.

Provincial policy recognizes that groundwater is an important component of aquatic ecosystems. With current technology, once groundwater contamination occurs, in most cases will continue over the long term. Policy also states that the emphasis on groundwater management is on pollution prevention.

Groundwater at the Williams and David Bell Mines at Hemlo, owned by Homestake Canada Inc. and Teck-Corona Operating Corp., is seeping outwards from the tailings area and contains elevated copper, zinc and molybdenum. At present, there is no means of collecting seepage from this area, which may worsen over time. At Golden Giant, the other Hemlo mine, tailings groundwater is also affected, although most of the seepage is collected. The underground workings of the Hemlo mines are acid generating and leachate toxic. Contaminants in the workings may seep out into the aquifer when the mine floods, but no assessment has been completed.

At the Winston Lake Mine, owned by Inmet Mining Corp. near Schreiber, the tailings pond effluent is being sent underground in order to flood the workings and avoid surface discharge. No monitoring of water quality in the workings and in the surrounding groundwater has been done and none is planned. Water in the workings may become more contaminated by acid generating/metal leaching materials underground and its pH is expected to decline over time. Water in the workings will flow outwards into groundwater through bedrock fractures and into the Whitesand River. To exactly where is uncertain.
When ore is being processed - first in the mill, and in later stages in the refinery or smelter - a number of chemical agents are as used. Chemicals used in high volumes at mine sites, primarily as reagents in the milling process, include ammonia, calcium chloride, chlorine, hydrochloric acid, copper sulphate, sodium cyanide and sulphuric acid.

Aquatic impacts from the hundreds of abandoned mines in the Lake Superior basin are largely unknown. Although government has funded site assessments at some of these mines, the focus of assessments has been on physical safety hazards. Water samples have not been taken and acid mine drainage/metal leaching potential has not been assessed.

Tailings at Empire Mine are high in arsenic.

### Acid Mine Drainage and Metal Leaching (AMD/ML)

A major feature of mining is that it produces an extremely high volume of waste: waste in the form of rock, or rock that has been crushed into fines at the mill and rejected, called tailings. A typical Canadian metal mine rejects 42% of mined material as waste rock, 52% as tailings, and 4% as slag. The remaining 2% comprises the “values” for which the ore was mined. The mining industry in Canada generates an average of 6.5 million tonnes of this waste per year. To put this number in perspective, it represents 95% of all solid waste generated in Canada each year. Approximately 20% of this waste has the potential to create acid mine drainage and to leach metals.

Most Canadian base metal, precious metal and uranium mines work with rock that contains metal sulphide mineralization. Depending on other associated mineralization in the rock, there is potential for the metal sulphides to oxidize when exposed to both oxygen and water, and generate sulphuric acid and dissolved metal ions when the waste material comes into contact with water.

<table>
<thead>
<tr>
<th>Year</th>
<th>Company/Location</th>
<th>Violation Details</th>
</tr>
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<tbody>
<tr>
<td>1999</td>
<td>Inmet Mining Corporation</td>
<td>failed toxicity tests for daphnia magna - mine effluent was lethal</td>
</tr>
<tr>
<td></td>
<td>Algoma Steel Inc.</td>
<td>failed toxicity tests for daphnia magna and rainbow trout - mill effluent was lethal; violated limits for pH in discharge</td>
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<tr>
<td></td>
<td>River Gold’s Edwards Mine</td>
<td>levels for total suspended solids violated the provincial limits</td>
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<tr>
<td>1998</td>
<td>Lac des Iles Mines Ltd.</td>
<td>Exceeded the provincial limit for total phosphorous</td>
</tr>
<tr>
<td></td>
<td>River Gold’s Eagle River Mill</td>
<td>Exceeded the provincial limits for total suspended solids, WAD cyanide, total cyanide and cyanide limits</td>
</tr>
<tr>
<td></td>
<td>River Gold’s Eagle River Mine</td>
<td>Exceeded the provincial limits for total suspended solids, un-ionized ammonia, pH and oil and grease limits</td>
</tr>
<tr>
<td>1997</td>
<td>Algoma Steel Ore Division</td>
<td>Provincial limits for total suspended solids and RSP were exceeded</td>
</tr>
<tr>
<td></td>
<td>Inmet Mining Corporation</td>
<td>Exceeded limits for BOD5 and phosphorous</td>
</tr>
<tr>
<td></td>
<td>Lac des Iles Mines Ltd.</td>
<td>Failed toxicity tests - mine effluent was lethal</td>
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<tr>
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<td>River Gold’s Eagle River Mill</td>
<td>Failed toxicity tests for daphnia magna and rainbow trout - mine effluent was lethal; exceeded limits for copper, pH and cyanide</td>
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</table>

Acid mine drainage and metal leaching (AMD/ML) may not start for decades or more after mine waste is first exposed to the elements. Once this chemical process begins, it can persist for hundreds to thousands of years. There is great uncertainty around predicting rates of acid generation and time to exhaustion. There are some means of preventing (e.g. flooding, dry covers) and treating (of effluent) for AMD/ML, but there is no walk-away solution. A mine that is generating or has the potential to generate AMD/ML must be monitored into perpetuity, and may require long term treatment.

The majority of mines studied in the Lake Superior Basin either have AMD/ML potential or analysis of potential has not been completed. For example, the Lac Des Iles Mine owned by North American Palladium Ltd., north of Thunder Bay, will generate over 175 million tonnes of waste and AMD/ML potential has not yet been properly assessed.

Acid mine drainage is the mining industry’s greatest environmental liability. Federal estimates of clean-up costs for acid mine drainage at existing mines are between $2 billion and $5 billion.
The “kill zone” created by fumes from Algoma Steel’s sintering plant in Wawa.

Arsenic is a well known poison. Found naturally in rocks, it is often released through the processing of ores for metal. Arsenic can damage the heart, nerves, liver and kidney, and can cause cancers of the skin, liver, bladder, kidney and lung. Arsenic can enter the body in food and water, or be breathed in fine dust.

The province of Ontario recognized that there was a problem, but provided an unusually low-tech solution. Algoma Ore Division was only required to control SO2 emissions when the wind was blowing towards the town. So the company simply didn’t burn sinter when the wind blew the wrong way. The net result was a forty kilometre “kill zone” downwind of the old sintering plant. The boreal forest cover has been eradicated, and extremely high levels of arsenic are found in the soils in and around the town of Wawa.

Wawa has been mapped into three zones, with Zone 1 being the area of lowest soil concentrations of arsenic and Zone 3 being the area of highest concentration. Most of the town is Zone 1 and 2, with Zone 3 being the outlying area in the general direction of the former sinter plant site. Concentrations approach 1,000 ?g/g in the surface soil near the AOD gate. Soil arsenic levels exceed the MOE soil cleanup guideline of 20 ?g/g over a large area of the fume kill zone. All school playgrounds and public parks, however, were found to have soil arsenic levels below the 20 ?g/g clean-up guideline.

Initial assessments of health risks posed by arsenic contamination prepared for the Wawa Environmental Steering Committee identify residents of Zone 1 as having a 1 in 100,000 risk of skin cancer, residents of Zone 2 as having a 6 in 100,000 risk, and residents in Zone 3 with a risk of 1 in 10,000.

A study of arsenic uptake into firewood identified elevated levels of arsenic in local edible mushrooms, and warned against their consumption.

The Township of Michipicoten is pursuing a $55 million class-action lawsuit against Algoma Steel Inc., holding the company responsible for the arsenic in the soil. The lawsuit is still wending its way through the courts and, to date, no remedial or clean up options have been identified by the Ontario Ministry of the Environment or Algoma Steel.
Mine Expansion - North American Palladium Goes into Overdrive at Lac Des Iles

One of the largest mines in the Lake Superior basin is going larger. North American Palladium’s mine at Lac des Iles has begun commissioning their expansion, moving from a 2,400 tonnes per day mill production to 15,000 tonnes per day by the end of 2001. The massive scale of the mine will be visible from a distance, with waste rock piles towering above the local terrain at 80 metres in height, twice as high as the highest natural feature in the area.

At full production the Lac Des Iles Mine will be producing approximately 15,625 pounds of palladium, 1,500 pounds of platinum, a thousand pounds of gold, 6 million pounds of copper and 2 million pounds of nickel per year, for a projected 17 years. The mine is the biggest palladium producer in Canada, with a workforce of 130 people pre-expansion, expected to rise to 275 at full production. The expansion will include the construction of a new mill, warehouse, maintenance shop, assay laboratory and water treatment plant in addition to the expansion of the mine itself.

Under federal environmental assessment law, any mine expansion that would increase ore capacity by 50% or 1,500 tonnes per day is to go through a comprehensive study - a more thorough review than simple projects require - because, as the regulation states, “certain projects are likely to have significant adverse effects” given their size. But, according to sources in the provincial government, the company has “worked with the Department of Fisheries and Oceans” in order to avoid having to do an environmental assessment of the expansion. Industry reports boast that the mine received the necessary construction permits just 60 days after deciding to expand.

Provincial reviews have been piecemeal, with the Ministry of the Environment amending already existing approvals to accommodate the increases in air discharges and liquid mine effluent treatment and discharge. One of the several provincial approvals is a water-taking permit that allows the company to draw 30 million litres of water per day. The Ministry of Northern Development and Mines accepted an amended closure plan, but are not required by current law to review it in-depth.

Gull Bay First Nation has identified a number of mine-related environmental impacts that could adversely affect their unceded traditional, aboriginal and treaty rights in and around the operations’ area. There have been only initial discussions between North American Palladium Ltd. and the First Nation.

At Work in the Mines - Silicosis a Major Concern in Hemlo Camp

Silicosis is a respiratory disease that most people think of as part of mining history. But in the Hemlo gold camp, 14 workers with silicosis currently have cases before the Workplace Safety & Insurance Board. The local United Steelworkers staff representative is aware of at least 2 more cases and suspects numbers may be even higher.

Silicosis is caused by exposure to silica dust, which comes from drilling, blasting and grinding ore, and working with backfill pastes, which contain crystalline silica quartz. The disease causes shortness of breath, and can lead to cancer or heart failure. Silica dust can be controlled through air quality controls, including ventilation, spraying water to control dust, and through safe work practices, such as the use of respirators.

“Miners’ health is being damaged through a combined effort of industry and the Ministry of Labour”, explained staff representative Mose Shepherd, alarmed by the high incidence of silicosis in the Hemlo mines.

“The Ministry of Labour keeps lousy records, and in recent years has started contracting out the x-rays of miners’ lungs. We’re seeing lots of cases of poor quality film being used, problems with tracking and matching, and some cases of a miner being told the results for someone else’s x-ray.”

Despite the confusion created by contracting out of the x-rays and poor record-keeping, the evidence is mounting that there are serious health concerns in the Hemlo camp. With 16 cases now identified, more miners have been getting X-rays since the alarm bell was sounded earlier this year.

But the silicosis may not show up until 15-20 years after the exposure to silica dust.
Costs of Clean-Up, Closure and Perpetual Care? Your Tax Dollars at Work

The Ontario mining industry produces $5 billion worth of minerals per year. With such a wealth of mineral resources in the province, high standards of care and clean-up by industry should be affordable. However, closure and clean-up costs may shift to taxpayers through corporate default or forfeiture, and now the offer of “exit tickets” gives companies the option of transferring long-term liabilities for a depleted mine property back to the Province, making cost of future care a public responsibility.

Government policy requires that, at the start-up of a mine, an approved closure plan detailing all clean-up requirements must be in place, with financial securities assured by the mining company sufficient to cover the cost of implementing the closure plan. However, the estimate of costs for mine closure and long term care is exempt from the public Access to Information law. If closure work and costing is underestimated, the public has no way of establishing whether realizable financial securities for mine closures have actually been posted by mining companies.

The Macleod Mine was operated by Algoma Steel Inc. in Wawa for 100 years and recently ceased production without an approved closure plan in place. Without an approved closure plan, there is no basis for estimating closure costs so it is unlikely that the mining company will post adequate financial securities. In the case of the MacLeod Mine, if Algoma Steel Inc. defaults, then taxpayers will be left to finance the perpetual care of the Mine properties, including the long term treatment of mine effluent.

At the Hemlo mines, estimated closure costs and associated financial securities posted by the mining companies, in conjunction with the mine closure plans, are much lower than real costs are likely to be. Closure plans for the mines do not include appropriate disposal or treatment of massive piles of acid generating / leachate toxic waste rock, nor do they evaluate the risk of groundwater contamination to the area through seeps from the tailings areas and underground workings. As a result, the official closure cost estimates may be only a fraction of real costs.

Major changes in legislation in the Mining Act in the late 1990’s have increased the public’s financial responsibility for the long term care of mines.

As a result of relaxation the rules around financial assurances for mine closure costs, companies can now “self-assure” their financial commitments to mine closure. Passing a financial means test means a company may not be required to post realizable financial securities for the cost of closure. This assumes that historical performance is an indicator of future financial strength - a gamblers assumption at best.

Another product of the mid-90’s relaxing of mining regulation, “exit tickets” are now available to mining companies operating in Ontario. After mine close-out, companies may now voluntarily surrender mining lands to the Crown, making themselves exempt from any future environmental liabilities, even if they arise as a result of the companies’ actions. The Renabie Mine, straddling the height of land that divides the Lake Superior and Arctic watersheds, may be the first mine to get an “exit ticket” in Ontario. Owners Barrick Gold Corp. and Homestake Canada Inc. have proposed an exit ticket fee of $102,290. Surface water flowing from the property contains elevated levels of zinc, cobalt, iron and copper, and acid mine drainage/metal leaching potential has not been fully assessed. In 1995, company reports declared that reclaimation work had been completed, except for some revegetation of the tailings areas. But in 1998 sink holes began to appear on the site, and in 1999 part of the underground mine collapsed, creating a gaping hole through to the underground workings. It is quite possible that the cost of fencing alone would exceed the proposed $102, 290 exit fee over time.

A major collapse in the underground mine has created a gaping hole.
Perpetual Care Requirements - the Mines that Never Go Away

After a mine has been closed, after buildings have been demolished and most structures removed, openings to surface have been capped, regrading has been done, and revegetation has been initiated, then the mine moves into a state of perpetual care. This means that the site must be cared for forever, or at least into the foreseeable future. All major mines require perpetual care for structural stability. In many cases, mine effluent will require long term treatment.

An example of perpetual care is the ongoing inspection of the stability of dams that contain tailings. Tailings dams have failed due to weaknesses in construction or from overtopping; overtopping can occur because the spillway is inadequate, or because beavers have built dams in the area. Major tailings dam failures have occurred in the Lake Superior Basin at the Zenmac Tailings, the Tribag Mine and the Coppercorp Mine.

The Hemlo mines, the Winston Lake Mine and the Shebandowan Mine all have impounded tailings that have the potential to generate acidic and metal contaminated discharge if they are not properly managed in perpetuity. These mines have planned to flood their impounded tailings at closure, thereby blocking the exposure of the tailings to air and preventing the onset of acid generation/metal leaching. In engineering a water cover to flood the tailings, a range of weather conditions (e.g. periods of drought) and the effect of weather on maintenance of the water cover must be modeled. However, the effects of climate change do not appear to have been accounted for in modelling future weather conditions at these mine locations. Forecasting for climate change in the 1990’s predicted a reduction in precipitation in the Great Lakes Basin of up to 25% - a reduction which could seriously affect efforts to maintain water covers over the tailings.

Perpetual care activities include treatment of effluent from acid generating/metal leaching waste. Waste can continue to generate contaminants for thousands of years. At the Geco and Wilroy mines, owned by Noranda Minerals Inc. near Manitouwadge, the volume of effluent requiring long term treatment is estimated to be 90 cubic feet per minute. Treatment for mine effluent from the underground workings at the Macleod Mine in Wawa will begin in approximately 10 years, when the underground mine workings flood and begin discharging to the surface. Treating mine effluent is costly, and the sludge precipitated from treatment must also be disposed of.

Planning for perpetual care involves playing with many unknowns, some of which have will have financial or environmental price tags attached.

Regreening: Some Benefits and Limitations

At major mines, regulations require that companies revegetate disturbed areas. Planting tree seedlings and sowing grasses and legumes after site disturbance is part of ongoing remediation. Revegetation helps to stabilize surfaces and improve aesthetics. While revegetation is required at producing mines, there are untold numbers of exploration sites where overburden has been stripped in order to examine rock surfaces. The cumulative impact of these sites on ecosystem productivity is unknown.

Terrestrial impacts from mining can include a significant aesthetic impact. Contouring and revegetation at close-out can improve site aesthetics. This type of reclamation work has been important at the Shebandowan Mine owned by Inco Ltd., since it is located on Lower Shebandowan Lake, which has important cottage and sport fishing value. Other impacts include erosion and dust.

In some instances, vegetation on mine waste may accumulate elevated levels of metals from the waste and these may be consumed by wildlife depending on their use of the site and the availability of metals. Currently, in Ontario, revegetation of mine waste does not require a serious evaluation of subsequent impacts from metal uptake into the food chain. At the Renabie Mine the Missanabie Cree First Nation is questioning the impact of the revegetated tailings area on the wildlife. Wildlife makes extensive use of the site, and may consume vegetation and salts on the tailings surface.

Waste rock piles at Leitch Mine with almost no revegetation - 35 years after closure.
Abandoned Mines - Not Gone and Not Forgotten

A mine becomes orphaned when it no longer has an owner. But a mine may also be considered abandoned if there is an owner that is unwilling or financially unable to carry out the necessary remedial work or ongoing care. There are more than 6,000 inactive or abandoned exploration or mining/aggregate sites in Ontario, with a significant number of them found in the Lake Superior Basin.

Abandoned sites may have suffered only from stripping and trenching or a single shaft with a waste rock pile. Larger sites may include old buildings, debris, fuels and oils, chemicals, waste including tailings, and many pits and shafts, often scattered throughout the bush.

Ontario’s abandoned mines program has been the good-news story of recent years, with $27 million dollars committed to the clean up of abandoned mines, including work on some of the worst cases in the Lake Superior basin.

In the early 1990’s a nearby resident began contacting the provincial government about the Zenmac site, an abandoned property near Schreiber. On two occasions, blowing orange dust from the Zenmac tailings was reported as a forest fire. The Province paid for a site assessment before the site reverted to the Crown in the late 1990’s, and in 2000, partial reclaimation was undertaken as part of the Province’s abandoned mines program. The tailings were covered with overburden and revegetated, in order to stabilizing the tailings surface.

Although the tailings have now been stabilized and revegetated, drainage from the site into Lake Superior continues to be toxic. A grab sample taken in June, 2001, showed elevated levels of cadmium, cobalt, nickel and zinc. Without further remediation, the tailings will continue to leach contaminants for an unknown period of time, perhaps indefinitely.

In some cases, abandoned mines are remediated as part of the closure work for an operating mine on the same or an adjacent property. One such case is Inmet’s Winston Lake Mine. As part of the closure work, the Company cleaned up the old Zenith Mine, which had operated at the turn of the last century. However, for many other abandoned mines there has been little or no action taken to date.

The Tribag Mine is located just west of the Batchewana River, which is a prime fishing and recreational river. The main tailings dam failed in the mid-80’s, releasing tailings into the Batchewana River and Lake Superior. Consultants reports have indicated that there is potential for tailings containment to fail again in the future, and have noted that a transformer on site may contain PCBs.

An 80 cubic metre pile of white powder of unknown composition is slowly being washed downhill. The site is considered abandoned, but as of 1993 it was owned by Sunburst Resources (1991) Inc. The Ministry of Northern Development and Mines wrote to the company asking them to clean up the site. The company did not respond, but it appears there was no followup action.

In the mid-1970’s, beavers building a dam in the tailings pond at the Coppercorp Mine near Batchawana Bay caused a tailings spill which washed out Highway 17, and flowed into Lake Superior. Consultants visiting the site in 1991 found that a 3.5 m high beaver dam was impounding a large volume of water; only their chance visit adverted another disaster. In 2001, two government employees happened to be out on a reconnaissance at the Coppercorp Mine and discovered that a massive beaver dam was retaining about 10 hectares of water in the tailings area. In both cases, discovery was by chance, rather than through regular and reliable monitoring.

The Ministry of the Environment has spent approximately $250,000 on reclamation work at the mine, but a court settlement resulted in only approximately $50,000 being recovered from the owner. The Ministry of Northern Development and Mines has now allowed mine ownership to revert to the Crown, making taxpayers responsible for the mine’s remediation and perpetual care.
Mining In The Lake Superior Basin - A Word From the U.S.

Ore boats and ore docks adorn tourists' postcards from Lake Superior.

Far from pretty, they testify to the emblematic stature of mining in the Lake Superior basin. And for good reason. For more than a century we’ve gouged, blasted and scraped metals from the basin's ancient rocks, extracting millions of ounces of gold and silver, billions of pounds of copper and hundreds of millions of tons of iron ore.

Mining and steel making built cities, bringing workers to Duluth, Sault Ste. Marie, Thunder Bay, the Keweenaw Peninsula and numerous smaller communities. Names such as Sinterville, Steelton and Taconite Harbor attest to the single purpose for settlement.

Though the new millennium has seen iron mining and steel making turn sour, mining and metals processing still employs thousands of workers in the basin, moving millions of tons of rock and drawing millions of gallons of water. And while iron mining and steel making seem in decline, new discoveries of platinum, palladium, rhodium, copper, nickel gold and other precious metals in the Lake Superior region have spurred renewed activity.

A new mineral rush is on and high tech exploration coupled with old mining practices threatens the natural resources of the region with renewed mineral development. Near Minnesota's Boundary Waters Wilderness and across Northeastern Minnesota mining interests such as PolyMet Mining Corp. and Cominco American Inc. have already made initial findings.

PolyMet is pursuing efforts near Silver Lake outside of Babbitt and Cominco is interested in using the ore crushing machinery at LTV's Hoyt Lakes facility.

The economic benefit of mining exacts an environmental cost. Copper mining on the Keweenaw peninsula has left a legacy of old mines and mountains of rubble. In its midst lies the Torch Lake Superfund site, a result of copper processing there. Other historic worsts are Reserve Mining's dumping of taconite tailings in the Lake from 1956-1981, and the now halted Copper Range smelter which for decades launched mercury, lead and arsenic into the air over Lake Superior by the ton. Recent proposals to expand mines near Marquette, Michigan include a plan to drastically alter the land and the flow of water, filling wetlands with tailings, replacing lakes and forests with massive rock piles and cavernous pits.

High water levels needed to float heavier and heavier loads of ore make the lake itself a threat to fragile aquatic habitats. Landowners on Whitefish Point pointed to the Lake's historically high lake levels reached in the late 1990's - more than four feet higher than in 1950 - as the cause for Superior's abrupt encroachment upon fragile sand banks, on-shore buildings and wetlands.

While mining scars the landscape, the boom and bust nature of mining jobs takes its toll on local communities. Even the most long-lasting of the basin's mining districts, Minnesota's Iron Range, with a projected life-span of 200 years (a blink of an eye for Lake Superior) is showing signs of wear. After mines shut down, high paying jobs turn to high risk unemployment.

And when desperate communities plead for help, the environmental consequences of development take a back seat to the need for cash flow. At the now shut-down Copper Range mine at White Pine on Michigan's Upper Peninsula. When an acid leaching project with potentially devastating ecological consequences was proposed on the heels of the company's 1995 lay-offs, local officials, merchants and laid-off miners fiercely defended the risky proposal as a solution for a lack of jobs, urging state and federal regulators to ignore environmental risks.

But will we learn the hard lessons taught by more than a century of mining on Lake Superior? We face a new century with the still un-met challenge to make Lake Superior a demonstration zone for zero discharge of persistent toxic pollution and ecosystem stewardship. And as fervently as we can envision healthy, diverse economies, clean water, clean air and renewed landscapes, the shifting shape of mining's global footprint poses serious challenges for Lake Superior's future.

To learn more about mining & environmental issues in the Lake Superior basin, contact:

The Lake Superior Alliance, an international coalition of community groups, committed to working together toward a cleaner future for Lake Superior. W3060 Cook Road, Sarona WI 54870 Tel: 715-635-8171 or 888-281-1735 Fax: 888-281-1735 www.superioralliance.org

Great Lakes United, an international coalition dedicated to preserving and restoring the Great Lakes-St. Lawrence River ecosystem. Buffalo State College Cassety Hall 1300 Elmwood Avenue Buffalo, NY, 14222 Tel: 716-886-0142 Fax: 716-886-0303 www.glu.org

To learn more about mining and related environmental and community concerns, contact:

MiningWatch Canada, a pan-Canadian initiative supported by environmental, social justice, Aboriginal and labour organisations. Suite 508, City Centre Building 880 Wellington St. Ottawa, Ontario K1R 6K7 tel. (613) 569-3439 fax: (613) 569-5138 www.miningwatch.ca

To learn more about mining and the environment and other issues in northeastern Ontario, contact:

Northwatch, a coalition of environmental and social justice groups in northeastern Ontario, addressing regional concerns such as land use, natural resource management, mining, logging, water quality, waste, and energy use. Box 282 North Bay Ontario P1B 8H2 tel 705 497 0373 fax 705 476 7060 northwatch@onlink.net www.northwatch.org

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Silicosis - continued from page 9

A seven-page questionnaire designed to help determine the extent of respiratory problems among the 1,000 Hemlo gold miners has been developed by the Steelworkers and the Ontario Health Clinic for Ontario Workers, based in Sudbury. The questionnaire asks workers about recurrent coughs, wheezing and chest ailments, and will be analysed by health clinic staff. Only two of the three mines in the Hemlo Camp are organized workplaces. The third, the Williams Mine, is without a union. Workers from all three mines will be included in the survey.

The Ministry of Labour says it has reviewed two years of air quality data and concluded that exposure is within acceptable limits, with exceedences representing less than 2% of the total data over two years. But health experts say that air quality data doesn’t tell the whole story, because it fails to take into account high incidents of exposure in extremely dusty conditions.

A study in March 2001 by the Ministry of Labour at the Golden Giant Mine showed some significant problems, even with the limited sample collection. Samples were collected by placing sampling pumps on 20 workers over two days. Several workplaces were found to be below company standards, with poor ventilation, equipment malfunctions, damaged fans, danger of creating muck runs if water was used to suppress the dust, and smoky conditions. The report concluded that all samples were “within the historical ranges as measured by the Golden Giant Mine”, that the company approach of stopping work until a problem is addressed is a good one, but that the workforce had not been made aware of the standards or of who is responsible.

Want to learn more? Try these!

At Work in the Natural World: Mining and Milling Ontario’s Natural Resources. 1999. An overview of forestry and mining in Ontario, including a description of crown land management and key mining issues in Ontario, Canada’s primary mining jurisdiction. Available from Northwatch.

List of Mines and Areas of Mining Activity in the Lake Superior Basin

Operating Mines

1-3 The Hemlo Gold Mines include both open pit and underground operations. The underground workings for the three Hemlo mines are connected underground. The David Bell and Williams mines are jointly owned by Homestake Canada Inc. and Teck-Corona Operating Corp. The Golden Giant Mine is owned by Newmont Mining Ltd. Closure of the mines is predicted for 2012 for Williams, 2006 for David Bell and 2005 for Golden Giant.

4 The Lac des Iles Mine produces palladium and is owned by North American Palladium Ltd. Mine production began in 1993 and predicted closure is 2011. The mine is currently under expansion from 2,400 tonnes per day to 15,000 tonnes per day.

5-6 The Eagle River Mine and the Edwards Project are gold mines owned by River Gold Mines Ltd. Ore from the Edwards Project is transported to Eagle River for processing. The most recent expansion at Eagle River will involve the development of the Mishi Pit.

Mines Under Closure

7-8 The Goudreau Mines gold mines were shut down in the early 1990’s and placed under temporary care and maintenance. Magino Mine is owned by Golden Goose Resources Inc. Kremzar Mine is owned by Canada Tungsten Inc.

9 Iron mining around Wawa began in 1899 and continued on and off for the next century. The Macleod iron mine is owned by Algoma Steel Inc. and was the last mine in the area to close.

10 The Winston Lake Mine produced copper from 1988-1998 and is owned by Inmet Mining Corp.

11 The abandoned Zenmac/Zenith zinc mine is located less than 1 km from Winston Lake and operated between 1898-1902 and 1966-1970. Inmet Mining Corp. has undertaken some reclamation of the Zenmac/Zenith Mine.

12-13 The Geco and Willroy copper/zinc mines are located within a few kilometers of each other and both are owned by Noranda Minerals Inc. Geco operated from 1957-1995 and Willroy from 1955-1977.

14 The Shebandowan Mine produced copper/nickel concentrate and operated from 1971 to 1992. It is owned by Inco Ltd.

15 The North Coldstream Mine produced copper, gold and silver and operated into the 1960’s. It is owned by A.C. West Ltd.

16 The Wawa Goldfields contain many abandoned mines that were developed starting in the early 1900s. The Citadel or Surluga gold mine owned by Citadel Gold Mines Inc. was operated from 1968-1991.

Abandoned Mines with Tailings

18 The Leitch Mine produced gold and silver. As of 1995, the mine was owned by Teck Corp.

19 The Dorion Mine produced lead and zinc.

20 The Tashota-Nipigon Mine produced gold, silver and copper.

21 The Quebec-Sturgeon River Mine produced gold.

22 The Pan Empire Mine is a past producer of gold and silver and is currently being explored by Roxmark Inc.

23 The Zenmac Tailings was the site used for milling ore from the Zenmac/Zenith Mine.

24 The Cline Mine produced gold and silver.

25 The Coppercorp Mine was recently owned by Maybrum Inc. before it reverted to the crown. It produced silver, gold and copper.

26 The Tribag Mine produced copper, silver and gold. As of 1993, it was owned by Sunburst Resources (1991) Inc.

27 The Lucinda Mine produced lead, zinc and copper.

28 The Prace or Sill Lake Mine reportedly produced lead.

Advanced Exploration Projects

29 Spider Resources has a 200 square kilometre claim in the Wawa area for diamond exploration.

30 Polymet Mining Company and their exploration partner Geomatic are developing a palladium property 10 kilometres north of Marathon.

31 River Gold Mine expects to bring the Mishi Pit open pit gold mine into operation in 2002.

32 Moss Lake Gold Mines is a gold property near Shendowan, west of Thunder Bay.

Summer 2001