

B.C. PLACER MINING

HIGH ENVIRONMENTAL IMPACTS VS. LOW ECONOMIC RETURN



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Based on data available as of January 2017*

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SUMMARY

Many of British Columbia's rivers, streams and drinking water supplies are at risk from hundreds of operating and thousands of abandoned B.C. placer mines. A lack of adequate regulation, monitoring, and enforcement allows mining activity to grow relatively unchecked while taxpayers receive very minimal economic return.

Placer mining—the practice of mining for gold in and near streams and riverbeds—is expanding across B.C. The province allows prospectors to stake claims in private property, salmon watersheds, and Indigenous lands, leaving local communities to cope with potential mercury contamination and other hazards.

Yet, despite the high risk of environmental impacts, the B.C. government is not adequately scrutinizing placer mining. A B.C. Ministry of the Environment audit in 2010 found high numbers of miners breaking rules. Additionally, we have found that, on average, only one in four placer mines with an active permit are inspected each year and fines for illegal activities are likely too low to deter bad practices.

Placer mining offers little in economic return to offset the environmental damage. In 2015, the B.C. government collected an estimated \$64,965 in royalties, and the placer miners who filed mineral tax returns reported gold sales of \$12,982,931. There were 542 placer mines with a permit to operate in 2016, and almost 3,000 placer claims reporting work.



Before and after photos of a placer mine site near Atlin, B.C.

KEY FINDINGS



High ecological risk from this industry and poor government oversight endangers the health of our fish stocks and watersheds, all for a small economic return.



The majority of placer mine sites are never inspected and riparian setbacks and fish habitat protection laws are unenforced by Ministries, and ignored by some placer miners.



Historic placer mining has likely left a legacy of mercury contamination, which may risk human health when disturbed by current mining activity.



The placer industry is a boom-bust cycle. Activity is increasing; with 542 sites holding an active Notice of Work permit (required to operate a placer mine) in 2016, up from a low of 187 in 2005.



Placer hand mining is also increasing, with 2,917 claims reporting work in 2015, up from 1,188 in 2005.

RECOMMENDATIONS

*Should placer mining be banned?
Who benefits? What are the trade-offs?*

1. Implement a moratorium on any future placer claim staking and work permits until the process can be reformed.

2. Engage First Nations as full partners in designing new placer mining legislation and regulations.

3. Ensure that all placer mining is contingent upon respecting the principles of Free, Prior and Informed Consent (FPIC), is consistent with the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), and reflects the recommendations of the Truth and Reconciliation Commission Report's calls to action.

4. Reform regulations for placer mining, which should include:

- A separate B.C. government unit to monitor mining activity as suggested by B.C.'s Auditor General.
- Improved placer mining environmental regulations that: ensure riparian areas have adequate protection; require annual inspections for all placer mines, including placer hand mining sites; increase fines for broken rules, automatically block permits for repeat offenders; do background checks for those staking a claim or operating a placer mine.
- Mandatory awareness training for placer miners regarding the environmental impacts of their industry and responsible environmental practices; and on the rights of local First Nations, traditional First Nation land uses, and the principles of FPIC.
- Increased monitoring and reporting that includes: government tracking of mercury and contaminants in B.C.'s major watersheds; and the collection and publication by the B.C. Ministry of Energy and Mines of relevant placer mining statistics such as the number of operating mines, mines permitted, claims reporting work, placer production amounts, the number of inspections, and enforcement actions taken and their outcomes.

ENVIRONMENTAL EFFECTS OF PLACER MINING

Placer mining has the potential to seriously damage watersheds and fish health, especially if regulations are not followed.

Placer mines:

- Work in and near riparian areas, which are important to fish health and survival.
- Can introduce sediment into streams, which has severe effects on fish health, and may carry other heavy metal contaminants.
- May disturb mercury used by gold rush era mines to extract gold. Historical information confirms placer mining discharged large amounts of mercury into the environment.

A LOT OF DAMAGE FOR LITTLE ECONOMIC RETURN

The placer mining industry provides little revenue to the government. A 2003 B.C. Mining Task Force, made up of B.C. MLAs, recognized the issue of low royalties vs. high regulation costs and recommended de-regulation of placer mining. According to the report, “much placer activity in B.C. is weekend and recreationally-based. The Task Force is struck by the fact that regulation of all placer activities under the Mines Act places substantial demands on the limited resources within the Ministry of Energy and Mines, particularly in comparison with the resulting modest government returns.”¹

Placer miners pay the province 0.5% of the amount received from the sale of their minerals.² Table 1 shows placer industry gold sales and tax collected from 2008 to 2015. The data in Table 1 was provided by B.C.’s Chief Gold Commissioner, and according to ministry sources, it reflects

Year	Total Gold Sales by Placer Mines Filing Mineral Tax Returns	Royalty on Gold Sales Collected by B.C. Government
2008	\$1,766,279	\$9,003
2009	\$4,173,266	\$21,145
2010	\$4,803,364	\$24,129
2011	\$5,237,438	\$27,657
2012	\$6,972,660	\$35,374
2013	\$6,269,999	\$31,554
2014	\$7,798,052	\$39,421
2015	\$12,982,931	\$64,965

Table 1. Total Sales of Gold by Placer Mines, and Royalties on Gold Sales Collected by B.C. Government. From Fair Mining Collaborative e-mail communication with Messmer, M. Chief Gold Commissioner, Mineral Titles Branch, British Columbia Ministry of Energy and Mines, April 26, 2016.



Settling pond near an active placer mine. Settling ponds retain water used on site so suspended sediment—often containing heavy metals, such as copper, mercury, zinc—can drift to the pond bottom. Some mines add chemicals that help speed up the rate of settling. These chemicals can be toxic to fish and wildlife.

Placer mining offers little in economic return to offset the environmental damage. In 2015, the most recent data available, the B.C. government only collected \$64,965 in royalties, and miners sold just under \$13 million in placer gold, a small sum considering smaller mines are exempt from paying taxes.

sales data collected by the Ministry of Finance through its mineral tax returns.³

The Ministry of Energy and Mines (MEM) also maintains a record of placer production amounts extending back to 1858.⁴ MEM numbers tend to be lower. For example, where the Ministry of Finance reported \$12.9 million for 2015, MEM's record of placer production reported just \$5.9 million for the same year. This report's authors believe the Ministry of Finance offers the most accurate record as it reflects sales, while MEM's record of placer production was created by simply assuming that placer mining accounted for 1% of B.C.'s total gold production.⁵ However, placer miners whose total gold sales are less than \$50,000 are exempt from filing mineral tax, and are therefore not included in Ministry of Finance data.⁶ Thus, there is no complete record of placer mining production or profits in B.C., and records we do have may underestimate the size of the placer mining industry.

PROBLEMS WITH WORKING IN AND NEAR STREAMS

Placer miners target areas (sandbars, ancient riverbeds and riparian areas) where water and gravity have concentrated gold and other minerals. These areas are important habitat and are essential for fish health.⁷ Placer mining can damage fish habitat by clearing riparian vegetation, digging in streambeds, and allowing sediment to enter the streams. The effects can be dire: a 1992 study of placer mining in the Yukon found unmined streams had 40 times more fish than placer-mined streams.⁸

Direct discharge of sediment-laden water into streams can have devastating consequences on the viability of fish populations near placer mines.⁹ High sediment levels harm fish, especially over a long exposure time,¹⁰ by eroding skin and gills, decreasing vision and food consumption, and suffocation of eggs laid in stream beds.

Placer activity can introduce sediment into streams in a variety of ways throughout the mine operation and afterward:

- Poor road construction and maintenance can increase erosion.¹¹
- Detrimental sediment loads can be released when miners do not 'reclaim' their sites during and after mining. Gravel and sand piles left behind by miners should be leveled, covered with topsoil, and replanted or they erode into streams each time it rains, over many years.¹²
- The 'beneficiation process' can introduce sediment into streams. During beneficiation, 'pay dirt' is mixed with water and runs through sluice boxes. Gold settles in small protrusions on the bottom of the sluice called 'riffles', while the turbulent water carries away the non-target clay and silt particles which become suspended sediment. Placer mining regulations require miners to divert 'process' water into a settling pond and allow the water to seep into the ground



WHAT ARE "RIPARIAN AREAS?"

Riparian Areas are the vegetation and soils along the sides of streams, rivers and lakes. The type of vegetation in these areas is usually different from the vegetation more distant from the waterbody.

Riparian Areas are essential to a healthy watershed because they provide:

- *Habitat for most terrestrial species, and rare and endangered species.*
- *Shade to lower water temperature, which improves fish health.*
- *Organic material (leaves, fallen trees) that is food for aquatic insects.*
- *Large contributions to recharging the groundwater aquifers.*
- *Erosion control that reduces the amount of sediment entering streams.*
- *Improved water quality by filtering contaminants.*
- *Migration pathways and green spaces, allowing animals to move between habitats.*

or reuse it, rather than releasing it directly into a stream.¹³ If done correctly, this practice stops harmful amounts of sediment from entering streams and hurting fish.

Suspended sediment can carry contaminants. Tests downstream of placer mines discharging directly into streams have found levels of aluminum, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, vanadium, and nickel that exceed drinking water guidelines.¹⁴

British Columbia has established riparian setbacks (the distance required between mining activity and the edge of a water body) to protect waterbodies from placer mining. Riparian setbacks are important because they slow down and filter surface rainwater flowing into streams and rivers, so less sediment enters the water body.

Despite their potential for destroying habitat, placer mining setbacks are smaller than the riparian setbacks required for other industrial land uses (Figure 1). Placer mining setbacks are usually 10 metres and allow work on un-vegetated gravel bars,¹⁶ where mineral exploration setbacks

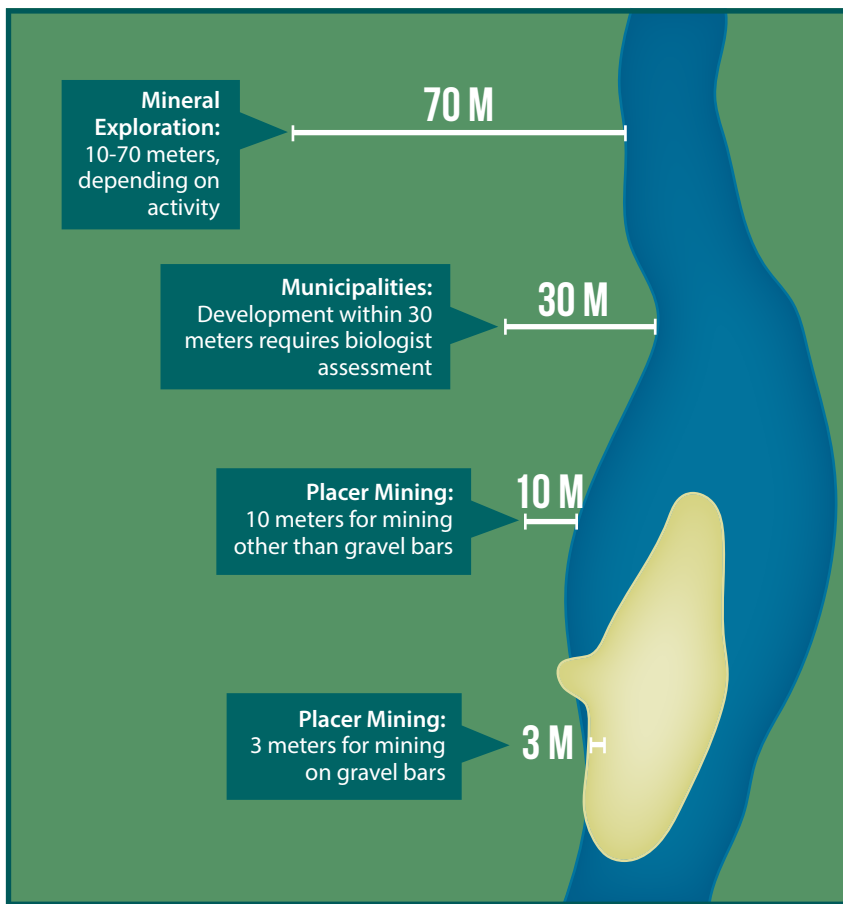


Figure 1. Comparison of Riparian Setback Requirements for Various Land Uses. For placer mining, Information Update Number 38 “Acceptable Practices for Placer Hand Mining In British Columbia,” requires riparian setbacks of 10m from the high-water line, except on un-vegetated gravel bars, for which a 3m setback is required. Gravel bars on the Fraser River require a 10m setback and 1m of elevation above the current water level.



NO RECLAMATION AT VAST MAJORITY OF B.C. PLACER MINES

The Ministry of Environment Placer Audit found only one of the 26 mines visited were undertaking the reclamation work required by their mine permit.¹⁵

We suspect that part of the reason that mines are not being reclaimed is due to low reclamation bond amounts. A miner pays the government a reclamation bond before they start working, and once work is finished, the government pays the miner back if the site has been reclaimed. If this amount is too low, the miner may not bother reclaiming the mine. FMC will be looking into reclamation bond amounts in an upcoming study.

Tests downstream of placer mines discharging directly into streams have found levels of Aluminum, Arsenic, Barium, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Vanadium, and Nickel that exceed drinking water guidelines.¹⁴

are 10 to 70 metres.¹⁷ Many municipalities enforce a 30-metre setback,¹⁸ the minimum width adequate to protect sensitive riparian habitat.¹⁹ Consequently, placer mines are allowed to work in areas that are vitally important to fish and wildlife, and off-limits to other industries.

Some placer miners ignore these comparatively lax requirements. The 2010 Ministry of Environment audit of 26 placer mines in the Cariboo region found:

- 13 mines working within the 10-metre riparian setback,²⁰
- 10 mines were operating in the stream without authorization, and of these, 3 were in critical fish habitat areas,²¹
- 8 mines were discharging wastewater into nearby streams.²²

MERCURY

Mercury is used by placer miners because it bonds with gold particles allowing for increased gold recovery and higher payouts. Mercury is separated from gold using heat or chemical processes. If proper methods are used, mercury can be recaptured. If treated carelessly, toxic mercury vapours can escape to the air and elemental mercury can be released to land and water, causing serious threats to human health and the environment.

Mercury is a well-recognized poison. The World Health Organization lists it as one of the world's ten most harmful chemicals.²³ It causes irreversible harm to fetus brains and nervous systems.²⁴ Inhalation of mercury vapor causes severe effects in adults and children, up to and including death. Mercury poisons fish and animals, and stays in the environment for a long time.²⁵ The primary route for human exposure is through eating mercury-contaminated fish.²⁶

One form of mercury, called 'methylmercury', is created when bacteria are exposed to small particles of elemental mercury.²⁷ Placer mining can create these small particles when new placer mines disturb stream sediments containing mercury left from historic placer mines. These small mercury particles are easily converted into methylmercury.²⁸

Methylmercury is more harmful than elemental mercury because it is easily taken up by living things and harms the environment and humans at much lower levels.²⁹ Methylmercury remains inside an animal's body and 'biomagnifies', meaning animals at the top of the food web have much higher methylmercury loads than animals at the bottom of the food web.

If modern placer mines follow the rules and use settling ponds, this lowers the risk of mercury from historic placer mines re-entering the ecosystem. However, illicit activities like discharging directly into streams, or working within streams, could allow mercury to re-enter the ecosystem. Placer miners might not report when they discover mercury on their claims because they are worried they must pay to clean it up.

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PLACER MINERS LEFT A TOXIC MERCURY MESS BEHIND IN CALIFORNIA

Mercury was used in California placer mines until the 1960s. The United States Geological Survey estimates that a typical mine lost several hundred pounds of mercury into watersheds each year. There were hundreds of mines operating from the 1860s to early 1900s, and the total mercury deposited in California watersheds is estimated between 3 and 8 million pounds.³⁰

B.C.'s gold rush started when a flood of prospectors arrived from California, bringing their knowledge and methods with them. We recommend immediate investigation of mercury levels in B.C. waterbodies that were heavily mined during the gold-rush to identify and contain contaminated areas.

Modern placer miners are not allowed to use mercury in their sluice boxes in B.C.³⁰ However, there doesn't appear to be a law against them using it later to separate fine gold particles from the mixture of other heavy minerals called 'black sand.'

Records from the Cariboo region report the extensive use of mercury during the gold rushes: some sources claim as much as 25 lbs of mercury was used per sluice box per day during the mid-1800s,³¹ while a United States Geological Survey estimated that placer mines in California during the same era discharged several hundred pounds of mercury a season.³² Some mercury flowed down the Fraser River and is in ocean sediment in the Strait of Georgia.³³ Other mercury is probably trapped in the sediment in former Gold Rush areas such as the Cariboo region in central B.C., and the Atlin region in northwestern B.C.

Despite serious environmental and health concerns with mercury in B.C.'s waterbodies, we found only one study examining mercury levels in historic placer mine areas: a 1995 study of the Lillooet River in the Port Douglas area which found elevated levels of mercury at some sites (at one site 200 times higher than expected background levels).³⁴ Recent conversations with B.C. placer miners confirm that mercury is commonly recovered with gold in some areas. Online placer miner discussion forums contain conversations about methods for separating gold from gold amalgam (the combination of mercury and gold),³⁵ suggesting either the discovery of historic gold amalgam or the current use of mercury in placer mining. Yet the Cohen Commission noted in 2012 that the government was not monitoring the Fraser River, or other B.C. waterbodies, for pollutants like mercury.³⁶

IF YOU MINE, THE INSPECTORS WON'T COME

Why did the Ministry of Environment find so many placer miners were breaking the rules? Governments use tools to encourage businesses to obey rules like inspections, fines, and incarceration. For these tools to work, fines need to be big enough to provide a financial incentive, inspections need to be regular and unannounced, and jail time substantial.

A placer mine needs a Notice of Work permit to operate legally. Figure 2 shows the number of Notice of Work permits active in B.C. from 1980 to present. The average percentage of Notice of Work sites inspected each year, over the past decade has been 26%, or about 1 in 4.

The penalty for environmental violations is low. Discharging sediment into a stream could result in a \$575 fine.³⁷ Working in a stream without a permit could result in a \$230 fine under the Water Sustainability Act.³⁸ Coupled with a low inspection rate, these fines are too low to curtail bad mining practices.

We also found a lack of inspections for placer hand mining, a small-scale mining activity that does not use machinery to excavate. Table 2 shows 2,917 placer claims reporting work in 2015, a dramatic increase from



BUT THE GOVERNMENT TESTS THE RIVERS FOR MERCURY, RIGHT?

The monitoring of the levels of contaminants such as mercury in major watersheds should be a roll filled by government ministries. However, in 2012, the Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River (Cohen Commission) stated:

"Contaminant monitoring as it relates to the health of Fraser River sockeye salmon has been neglected by DFO and Environment Canada for jurisdictional reasons. It matters little whether Environment Canada considers its jurisdiction to cease at the end of an outfall pipe, or that DFO's decision to cut its Toxic Chemicals Research Program nearly a decade ago and to disband its Pacific Region Water Quality Unit was done without consultation. The effect is that neither department is currently monitoring contaminants in freshwater or marine habitat that may negatively affect Fraser River sockeye productivity."³⁶

1,188 in 2005. (As factors other than placer hand mining influence this statistic, it should be viewed as a general trend of placer hand mining.)³⁹ Despite the high levels of this type of activity, we found no evidence of any inspections on placer hand mining by any government agency.

Our findings of inadequate enforcement are consistent with the Auditor General's recent report on the Ministry of Energy and Mines. The Auditor

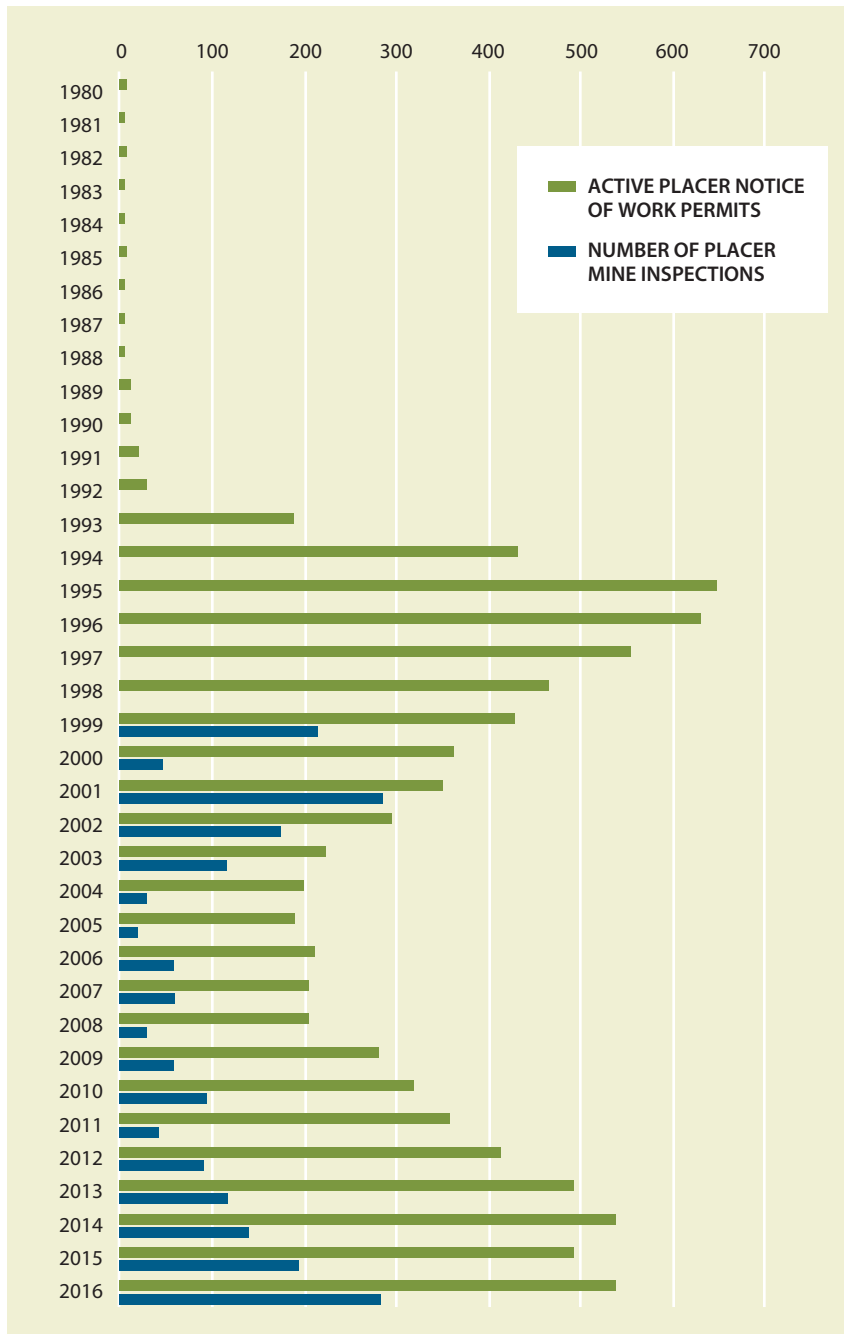


Figure 2. Number of active Notice of Work permits calculated from data in FOI Request - EGM-2016-63772. Number of inspections from British Columbia, Ministry of Energy and Mines, "Annual Report of the Chief Inspector of Mines" (2001-2014). FOI Request - EGM-2017-70745 (2015, 2016)



Sediment-laden water flowing from a placer mine site. These sediments can carry contaminants, such as aluminum, arsenic, and chromium—sometimes in levels that exceed drinking water standards.

“MEM (Ministry of Energy and Mines) has a limited compliance and enforcement program and weak planning, and therefore its regulatory oversight activities are inadequate.”

– AUDITOR GENERAL

general found that “MEM has a limited compliance and enforcement program and weak planning, and therefore its regulatory oversight activities are inadequate.”⁴⁰

Although placer mining does not have high economic returns, as noted by the 2003 B.C. Mining Task Force, the industry is centered in areas that need a high level of environmental protection to ensure the health of B.C.’s fish stocks and drinking water supplies. Yet the Mining Task Force recommended that the industry be de-regulated in response to low government returns.⁴¹ As apparent in Table 2, the inspection rate dropped following the Task Force report. This low inspection rate may have helped create the situation noted in the MoE audit, which found a significant portion of placer miners breaking the rules. Thus, the savings gained by the provincial government from de-regulating the placer industry likely has a steep cost to fisheries, drinking water, and at-risk species, costs which need to be assessed and accounted for.



Despite the large size of some mines, only one in four mine sites were inspected on average each year in the past decade.

A	B	C	D	E	F
Year	Placer NoW Permits Issued	Total Number of NoWs Within Stated Operating Period	Number of Placer Mine Inspections	Inspection Rate	Placer Claims Reporting Work
2000	66	358	43	12%	no data
2001	135	347	287	83%	no data
2002	169	292	182	62%	no data
2003	207	221	123	56%	no data
2004	205	197	29	15%	no data
2005	176	187	19	10%	1188
2006	195	209	54	26%	1349
2007	167	203	61	30%	1455
2008	164	204	28	14%	1350
2009	208	278	49	18%	1496
2010	190	316	96	30%	1640
2011	153	356	39	11%	1694
2012	185	410	82	20%	2557
2013	368	488	110	23%	2595
2014	234	531	134	25%	2712
2015	213	539	190	35%	2917
2016	no data	542	280	52%	no data

Table 2. Column C calculated from data in FOI Request - EGM-2016-63772. Columns B and D, 2000 to 2014, from: British Columbia, Ministry of Energy and Mines, “Annual Report of the Chief Inspector of Mines” (2001-2014); Column B, 2015, Column F, 2015, from: Messmer, M. Chief Gold Commissioner, Mineral Titles Branch, Personal E-mail Communication to FMC, British Columbia Ministry of Energy and Mines, April 26, 2016. Column F, 2005-2014 from: British Columbia, Ministry of Energy and Mines, Mineral Titles, “Physical Work on Mineral and Placer Claims, 2014” January 26, 2015. Column D, 2015-2016 from: FOI Request - EGM-2017-70745.

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35. Gold Prospector's Network; online: <<http://gpex.ca/smf/index.php?topic=1618.0>>. Beginning 2010, conversations regarding mercury moved to the member's-only area.
36. Bruce I. Cohen, "The Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River" Vol 1, Chapter 6, Habitat Management (Vancouver: Queen's Printer, October 2012) at 322.
37. British Columbia, Ministry of Environment, Environmental Violations Database, Search Criteria: Environmental Management Act Section 6(3); online: <<https://a100.gov.bc.ca/pub/ocers/searchApproved.do?submitType=menu>>.
38. British Columbia, Ministry of Environment, Environmental Violations Database, Search Criteria: Water Act Section 93(2)(q); online: <<https://a100.gov.bc.ca/pub/ocers/searchApproved.do?submitType=menu>>.
39. Several factors influence "Placer Claims Reporting Work" statistics. First, this number likely includes full scale placer mines operating under a Notice of Work permit, as these mines would still be required to report work to maintain their claim. Secondly, by using the Portable Assessment Credit (Mineral Tenure Act, RSBC 1996, C 292, s 31) miners may claim the cost of work in one year and carry it forward as payment in lieu of work in subsequent years without visiting the mine site. Miners also commonly spread the costs of work across all adjacent cells and claims, but only perform physical work on one or two claims. Finally, some placer hand miners may work illegally entirely without a claim.
40. British Columbia Ministry of Finance, Office of the Auditor General, "An Audit of Compliance and Enforcement of the Mining Sector" (Victoria: Queen's Printer, May, 2016), at 6; online: <<http://www.bcauditor.com/pubs/2016/audit-compliance-and-enforcement-mining-sector>>.
41. British Columbia, The B.C. Mining Task Force of the Government Caucus "Restoring the British Columbia Mining Industry", at 47; online: <<http://ralphsultanmla.ca/wp-content/uploads/sites/60/2014/07/>>.



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