

The Yukon Gold Rush: Early Examples of the Socioeconomic and Environmental Impact of Mining

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Introduction

The Gold Rush of the late 19th and early 20th century was a momentous historical and social event. However, it was also one of the first instances of large scale mining in a remote and yet relative virgin area. The negative effects of mining on the landscape, the flora and the fauna of Yukon in general and Klondike in particular are one of the earliest examples of the environmental impact of extensive and unregulated mining. In the event, the Canadian authorities proved totally unprepared to handle the massive influx of people, issuing miner's certificates without restrictions to aspiring prospectors and allowing them free use of a given site by the river, with no restrictions on tree cutting and fishing. In 1898 alone, 34364 miners' certificates were issued by the authorities. There were two main ways which were followed by individuals and organised groups of people. The seaborne route started from either Seattle or Victoria, to the northwest, in Nome, where then people boarded boats to sail upstream in the Yukon River, all the way to Dawson City. Overland routes started when the prospectors arrived by boat at Skagway and Dyea, and then followed already established trails. Others came through more northern routes staying at all times inside the Canadian borders. In any case, at some point prospectors would have to use either a canoe or a boat – either carried with them during the journey or constructed on the spot – to arrive in Dawson via Yukon River or one of its tributaries. Then began the race to find and claim an area to mine and then the arduous task of placer mining. Following the first report of gold in 1896, the next ten years would mark one of the most radical transformations of local society and environment.

Geology of Au Ore Deposits in the Klondike area

The gold found in the placer deposits in Klondike is characterised by limited dispersion and originates from the erosion of orogenic gold mineralisation in the Klondike Schists. This mineralising event occurred after regional compressional deformation in the Jurassic, approximately 100 my after a Permian metamorphic event (MacKenzie *et al.*, 2008). Since their discovery, more than a century ago, the goldfields of the wider area have produced around 311 tonnes of gold. The bench and creek placers are fluvial in origin, and their age ranges from Pliocene to Holocene. The goldfields rest upon medium-grade and high-grade metasedimentary rocks, metaigneous rocks of the Yukon-Tanana terrane, and a small amount of ultramafic rocks of the Slide Mountain Terrane. The orogenic gold mineralisation comprises discordant mesothermal quartz veins (Lowey, 2006). Their mineralogy is characterised by anhedral milky quartz, with minor amounts of carbonate, barite, muscovite, pyrite and galena (Rushton *et al.*, 1993), while reported gold grades of up to 9 Kgr/ton have been reported. Gold recovered from the placer deposits of the area manifests in many different forms, from large nuggets to very small grains actually floating on the water. This gold is almost entirely detrital in origin and its source are the aforementioned auriferous quartz veins. The placers themselves are fluvial in origin and their formative mechanisms were controlled by tectonics and climate. A prolonged period of weathering combined with isostatically compensated exhumation turned the quartz veins in a quartz-rich residuum that was then reworked in the Au gravel deposits of the Klondike area. The lower level gravel deposits are richer in Au due to successive circles of aggradation and incision which were related to reconcentration of the placer gold (Lowey, 2006).

Placer Mining Methods

Usually, in order to get to the gravels containing gold grains, the soil covering them had to be removed. But since the soil, averaging around 2-3 m, was frozen it had to be thawed. This was achieved by lighting numerous fires and when the soil was sufficiently softened it was removed using shovels and buckets. Upon reaching the gravel layer, the miners used mercury in the sluice boxes. Mercury amalgamates with gold and can be used to separate it from the ore. It is subsequently removed during the refining process. Another method was hydraulic mining, which involved using the water of the rivers and streams to strip the overburden of the gravel. Usually, hydraulic concessions were issued, involving 5 mile lengths of the river. The water was transported by wooden flumes or canals and the heated to increase its pressure. In this way, pressurised jets of water were directed against gravel and vegetation on the walls of the river streams. Some companies also employed dredging using suitably modified riverboats. In this way it was possible to recover gold even from submerged riverbeds. This method destroyed the topography of riverbeds, and also in many cases altered the flow of streams or created small lakes. Moreover, the use of mercury during dredging contributed to the pollution of both land and water.

Environmental Impact

The uncontrollable influx of miners in the years following 1896 resulted in severe degradation to the local environment. In particular, the forests of the area were almost destroyed, since the mass of incoming aspiring gold diggers needed copious amounts of wood for building and boat construction, for cooking and for heating purposes, for boat building, as steamship and locomotive fuel and for infrastructural improvements. Collateral damage by accidental fires destroyed

the forests even more. In less than two years, the vast majority of trees had been cut down, radically altering the local landscape. This deforestation resulted in poor water retention properties by the soil, exponentially increasing flash flood probability, and also in a lower water table. Dredging and the melting of the permafrost by fires altered the vegetation and the topography of the area permanently (Willis, 1997). Furthermore, mercury remains in the soil and in the river water to this day, further endangering a host of animal species. Besides these negative effects, intense hunting and fishing almost destroyed the local fauna, altering the balance of the ecological system, creating interrelated side effects that would persist for decades. Finally, for sanitation reasons, waste from Dawson City was emptied on the Yukon River, exacerbating the environmental degradation.

Socioeconomic Consequences

From the many thousands of people who, upon hearing about stories of unprecedented wealth, set for the area of Yukon, less than half would eventually arrive and an even smaller percentage would actually find gold. Amongst the miners who would persevere through successive harsh winters, coupled with inadequate diets and virtually non-existent sanitary conditions, many would fall victim to a host of diseases, and most notably typhoid fever. Of particular interest is the extensive appearance of scurvy in miners, which further denotes the malnourishment of the people and their negligence for their health. In addition, as the Gold Rush was associated with the seasonal movement of large masses of people, overland or through the river network, there was a cyclic seasonal spread of pathogens, and the emergence of diseases not normally existing in the area. Such was the nature of malaria, which affected many of the people in the area during the Gold Rush (Hight, 2008). Also notable is the transience of miners in the area during the Gold Rush. Most aspiring gold miners rushing to the area of Klondike did not believe that they would stay there more than one or two years. The notion of finding gold in the river streams, via digging and panning, appealed to many relatively poor men who aimed at coming back home with a small fortune with a relatively meagre monetary investment. In reality, not all could find a promising place to stake a mining claim and a good percentage of arriving prospectors worked in pre-established claims, or found employment in other posts in the city (Brand, 2003). Gradually, after 1906, larger companies would buy most private expanses in the creeks and use more large scale and sophisticated dredging methods. In any case, individuals usually lacked the money and technical knowledge necessary to exploit in full their small claims. Thus in the space of ten years there was an almost complete industrialisation of the gold digging process. The state favoured such an outcome, since it was easier to regulate larger companies, and in fact, environmental pollution and degradation were significantly lessened by the application of more effective methods – dredging however would continue unabated until 1966. The expansion of the City of Dawson itself and the acquiring of large tracks of land by westerners had another negative side-effect: the native populations of the area – the Tagish, Tutchone and Han Indians – gradually disappeared from the area. These Indians were ravaged by diseases and faced starvation as overhunting resulted in the disappearance of most animals and overfishing and dredging lead to the fish disappearing from streams and rivers (Willis, 1997). The creation of an extensive mining community within the space of two years meant that more permanent infrastructural ameliorations were necessary. Roads and railways were constructed and regular boat trips from Seattle and Victoria were established, to transport the myriads of prospectors and supply Dawson. Like Dawson, Skagway and Dyea, other towns along the miner migration trails grew from small settlements and ports having no docking facilities, to large scale cities, in a matter of one or two years, due to influx of passing miners and people associated with the rendering of services. Such towns were in the beginning initially lawless and it was a while before the state managed to impose law and order.

Conclusions

In effect, the expansion of Western culture and associated socioeconomic organisation spread through the vast territories of Canada and the USA through the emergence of local capitalist economies, which were then gradually linked to the wider national socioeconomic network. In assessing the effects of the Gold Rush, it is evident how geology had a formative effect on the creation of a new socioeconomic fabric in an area quite distant and marginal in respect to state interventionism, state control and Western culture in general. The existence of the Klondike gold deposits sparked a torrent of social mobility and proved the focal point for the urbanisation and industrialisation of much of NW Canada. In studying the history of the Gold Rush, the transition from individual to corporate mining also becomes evident. One of the cardinal points of this story however is the danger to man and environment alike, if mining is left unregulated by the state and comprehensive environmental restoration and sustainable mining schemes are not enforced. Today, 113 years after the end of the tumultuous period of the Gold Rush, the damage to the environment and wildlife is still evident.

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