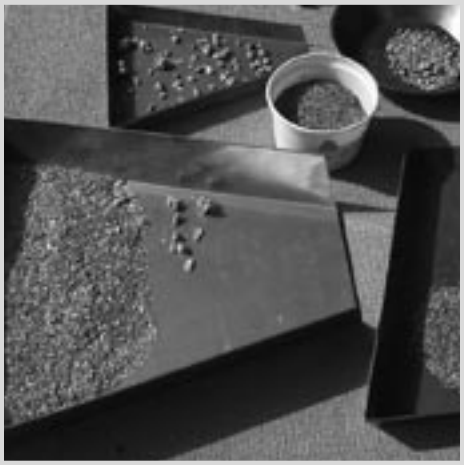
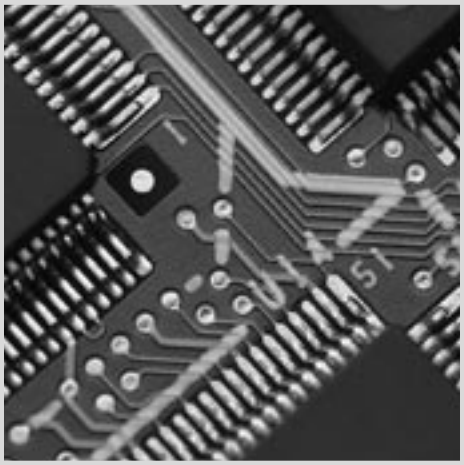
Modern Day Placer Mining in the Yukon

This publication describes the science, technology, economics and social aspects behind modern-day placer mining and reclamation. It is a production of the Yukon Government, Yukon Chamber of Mines and Klondike Placer Miners' Association.





Mining Lands Office — Yukon Government Photo

Printed in Whitehorse, Yukon, 2005

ISBN 1-55363-2243

This and other publications are available from:

Energy, Mines & Resources, Yukon Government
P.O. Box 2703 (K102), Whitehorse, Yukon Y1A 2C6

Phone: 867-667-3130 • Fax 867-667-8601
Toll free (Yukon) 1-800-661-0408 • ext. 3130
emr@gov.yk.ca

Publications may be downloaded free of charge at http://yukonmining.com

You may also contact:

Klondike Placer Miners' Association
3151B Third Avenue, Whitehorse, Yukon Y1A 1G1
Phone (867) 667-2267 • Fax (867) 668-7127
E-mail kpma@kpma.ca • http://www.kpma.ca

Yukon Chamber of Mines
3151B Third Avenue, Whitehorse, Yukon Y1A 1G1
Phone: (867) 667-2090 • Fax: (867) 668-7127
E-mail: info@ycmines.ca • http://www.ycmines.ca

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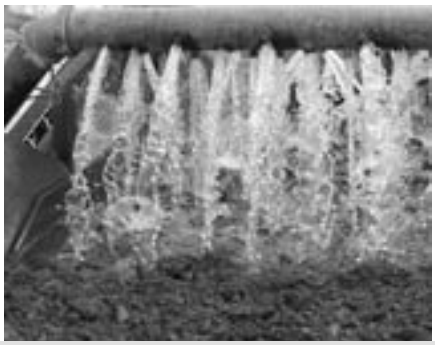
This publication comprises a series of articles originally published in the Yukon News between February and September 2004.
All articles written by Elaine Schiman

The Makings of a Placer Mine

Mike McDougall and his daughter, Sarah, in the Sixtymile River valley upstream of a former settling pond mined by Mike's father, Charles. — Kim McDougall photo

When Tara Christie's family first began placer mining in the Yukon in the mid-eighties, she was a child, just eight years old. She has fond memories of living on their claim at Scroggie Creek near Dawson City during the Yukon summers, and wandering in the bush with her dad, exploring and testing for gold. Fast forward twenty-odd years to the present day and at 30, Tara is now a full participant in the family's placer operations near Dawson City, and serves as the Executive Director of the Klondike Placer Miners' Association.

Although still a young woman, Tara, along with other Yukon placer miners, has seen tremendous changes in the way their industry operates in the Yukon. Even greater changes have occurred in the century that has passed since the Klondike Gold Rush. The image of the gold seeker with his shovel and gold pan is one that permeates Yukon culture and history. This lasting image, though resonant of the Yukon's past, doesn't have much to do with the way placer mining operates today. Modern-day placer mining has been greatly affected by new developments in technology, regulatory regimes and requirements for environmental protection.



"The Klondike Placer Miners' Association wants to make sure Yukoners are up-to-date about what placer mining is like in the 21st century, and what that means for our economy and our environment," says Christie. "Placer mining is a long-established and important industry in the Yukon, but it's so highly-specialized and technical, it's not well understood."

The Yukon Geological Survey's placer mining overview for 2003 shows about 125 operating mines, employing about 400 people, primarily in the Dawson, Whitehorse and Mayo Mining Districts. It also estimates about 600 additional jobs that are generated in related service and hospitality sectors.

"Placer mining has been a mainstay of the Yukon economy for more than 100 years," says Mike McDougall, the President of the Klondike Placer Miners' Association. "For example, in Dawson City, we have a greater selection of grocery stores and other businesses than might be possible without the dollars spent by the placer mining community. That's just one small example of how placer mining contributes to the Yukon's economy."

The following articles provide a primer on modern placer mining, covering what it takes to open, operate and eventually close a placer mine.

"We hope that this publication will provide a resource for Yukoners who are interested in learning more about the science, technology and economics behind modern-day mining and reclamation, as well as some slice-of-life stories about what mining is like for individuals and families who are involved in it," says Christie.

Her own family's business, Gimlex Gold Mines, has placer mined in several locations near Dawson City and is in the process of restoring and closing down their current site and opening up a new one.

"Because we're going through a period of change in our operation, it's a good opportunity to talk about what it takes to move from one stage of mining to another," says Christie.

But not even the first stages of mining can take place until the geological formations are in place to support them.

Resistance to Corrosion

Gold is the most non-reactive of all metals. It is benign in all natural and industrial environments. Gold never reacts with oxygen (one of the most active elements), which means it will not rust or tarnish. The gold death-mask in the tomb of Tutankhamun looked as brilliant when it was unearthed in 1922 as when it was entombed in 1352 BC. (Excerpt from The Gold Institute)

Photo above: *Washing and screening pay gravel through a grizzly prior to it going through a trommel in sluicebox. — Bill LeBarge photo*

Placer Mining: The Search for Gold in the Gravel

The term "placer" is a Spanish word meaning "place where gold can be recovered from gravel." But which gravel? This question is a mystery that still fascinates prospectors and placer miners alike.

"There's a certain allure to the idea of looking for gold," says Tara Christie, Executive Director of the Klondike Placer Miners' Association and partner in Gimlex Gold Mines of Dawson City. "No matter how much gold has already been found, there is always the chance of gold deposits somewhere out there, waiting to be found. That's what keeps placer miners at it, and draws new people as well.

Yukon Geological Survey placer geologist Bill LeBarge. — Yukon Government photo

But it's more than just chance or luck. The science of geology contributes greatly to the placer mining industry. Placer miners have a huge interest in understanding how the gold gets there in the first place, and where we are most likely to find it."

As new developments in geoscience occur, much of the information is passed on to placer miners through the Yukon Geological Survey, a branch of the Yukon government's Department of Energy, Mines and Resources.

"The work of the Survey gives placer miners information about how deposits are formed," says Christie. "The science of gold deposits has evolved so that we now have a much better idea of which areas have the best potential."

Bill LeBarge is a placer geologist with the Yukon Geological Survey. He visits placer mines throughout the territory, collects gravel samples and gathers information on what areas are being mined, how much gold is being produced, and what methods and equipment are being used. That information is then shared with placer miners and the public through various reports, articles and presentations. Much of the information is also found in the Placer Database, first created two years ago and currently being updated.

"The transfer of information is very important," says LeBarge. "We have

information that can help placer miners understand their deposits and do their work more economically, but in turn, we rely on the knowledge placer miners have about their own ground."

A basic piece of geological information is whether the land was ever covered by a glacier. In other words, is the ground glaciated or unglaciated? Geologists also look at when the land was glaciated, how many times and what layers have ended up on top. They study the "stratigraphy" or in other words, the layers of gravel, lake sediment and glacial deposits.

The majority of gold production in the Yukon, about 85 per cent, comes from unglaciated areas, where the geology was not complicated by the movements of glaciers.

"Glaciated areas are more difficult to understand," says LeBarge. "The way the glacial ice flowed into the valley affects how the gold deposits were buried. Or in some cases the gold would have been encompassed into the glacial material, and diluted."

As a result, glaciated areas only provide about 15 per cent of total gold production in the Yukon. But that is slowly changing, says LeBarge.

"Now that we're learning more about how placer deposits occur, the new trend is to explore in glaciated areas as well."

Placer gold deposits occur when gravel that holds minerals is washed many times by the flow of creek water. Gold, one of the heaviest minerals, tends to drop down during the washing process, until it can go no further. It gradually finds its way to some impermeable layer, like bedrock or thick clay.

Placer miners and others are still captivated by the idea of the motherlode … the place from which the gold originates in the bedrock. The idea is that if you can find the motherlode, you'll also find a whole lot of gold. No one knows for sure that such a motherlode even exists, but there are tantalizing clues.

"The Mount Nansen hard rock gold deposit near Carmacks has the same geochemical composition as placer gold nearby," says LeBarge. "So we can conclude that the placer gold came from the hard rock deposit."

In the Klondike area, small gold veins have been found, but no larger possible sources of bedrock gold.

"People have been looking for a motherlode for a long time," says LeBarge. "One theory is that the bedrock gold has already been completely eroded into the creeks and no longer exists.

Whatever the fate of a possible motherlode, it seems clear that there are still placer gold deposits to be found in the Yukon. And although geoscience provides the baseline information for placer miners, it's still up to the individual miners to find and choose the patch of ground they believe will pay off.

Electrical Conductivity

Gold is among the most electrically conductive of all metals. Since electricity is essentially the flow of charged particles in a current, metals that are conductive allow this current to flow unimpeded. Gold is able to convey even a tiny electrical current in temperatures varying from -55° to +200° centigrade. This makes gold a vital component for electrical connectors in computers and telecommunications equipment. (Excerpt from The Gold Institute.)

Photo above: *Yukon Geological Survey summer students sampling pay gravels at a placer mining operation in the Sixtymile River. — Bill LeBarge photo*

A Placer Mine at Stake

When placer miner Tara Christie was just a kid, she would tag along with her dad in the bush around Dawson City. Their family was mining at Scroggie Creek, but like most placer miners, they were also on the lookout for other promising ground to stake.

Tara was often there to see her dad sink the two posts into the ground and write his claim upon them. She probably even helped him do it. But according to placer mining laws, it wasn't until she was 18 that she could stake her own claim.

"Staking my first claim was a rite of passage," says Christie. "Finally, it was my name written on the post. It was a part of growing up, in the same way that getting your first moose, or your driver's license, might be for other kids."

Waiting until the age of 18 is just one of many rules that placer miners must follow.

"Staking a claim is quite an accessible thing," says Christie. "The system is very open, allowing anyone the right to stake and obtain mineral rights to open ground for just ten dollars. But you have to educate yourself about the rules, in order to do things right."

One of the best ways to find out about those rules is to talk to one of the territory's four Mining Recorders, in the Dawson City, Mayo, Watson Lake and Whitehorse Mining Districts.

The information is available in other places too, like the Internet, at www.yukonminingrecorder.ca. "But we find it works the best when someone comes in to talk to us," says Kathryn Perry, the Mining Recorder in Dawson. "That way, we can answer questions and ensure they really understand what's required."

The requirements for staking a claim are very specific. A post must be placed at each end of the claim, which can be no longer than 500 feet. The staker must clear the bush between the two posts to provide a clear line of sight, or what's called a "location line." Even the size of the post is stipulated. Then the post must be inscribed with the name or number of the claim, its length, the date and the staker's name. The claim must then be recorded with the Mining Recorder. If the claim is within ten miles of the Mining Recorder's office, the staker has ten days to record it. For every additional ten miles of distance, another day of "travelling time" is allowed.

"The law has been that way for a long time," chuckles Perry. "But there can often be a rush at the last minute, even for miners who live right in Dawson. We still get a surprising number of

Kathryn Perry, Dawson City Mining Recorder. — Yukon Government photo

people coming in at a quarter to five on their last day of travelling time."

If all that is done properly, the miner has the placer claim. But that's not the end of it. In order to keep the claim, the miner must carry out at least $200 worth of work there annually, and then file it with the Mining Recorder's office by the claim's anniversary date. That's to ensure the ground, as a public resource, is being worked, and not unduly tied up, thereby preventing someone else from staking and working it.

Wild adventures of various kinds are common during staking. Perry recalls one Dawson area miner who has a tendency to have narrow escapes. "Whenever he comes into the office, we always ask him about his latest adventure. Once he told us about encountering an angry grizzly bear while staking. The bear charged, and the miner had to fend him off with little more than hand tools."

Other adventures involve the race to re-stake a claim that is expiring because the necessary work was not done and the claim was not renewed.

"An unworked claim will expire at midnight on its anniversary date," says Tara Christie. "Then the race is on. People will walk or even run out to the site to try to get the ground staked first. It gets very competitive. You might be heading out there, suddenly hear a helicopter overhead, and then you know you're likely to get there too late. It can be pretty exciting."

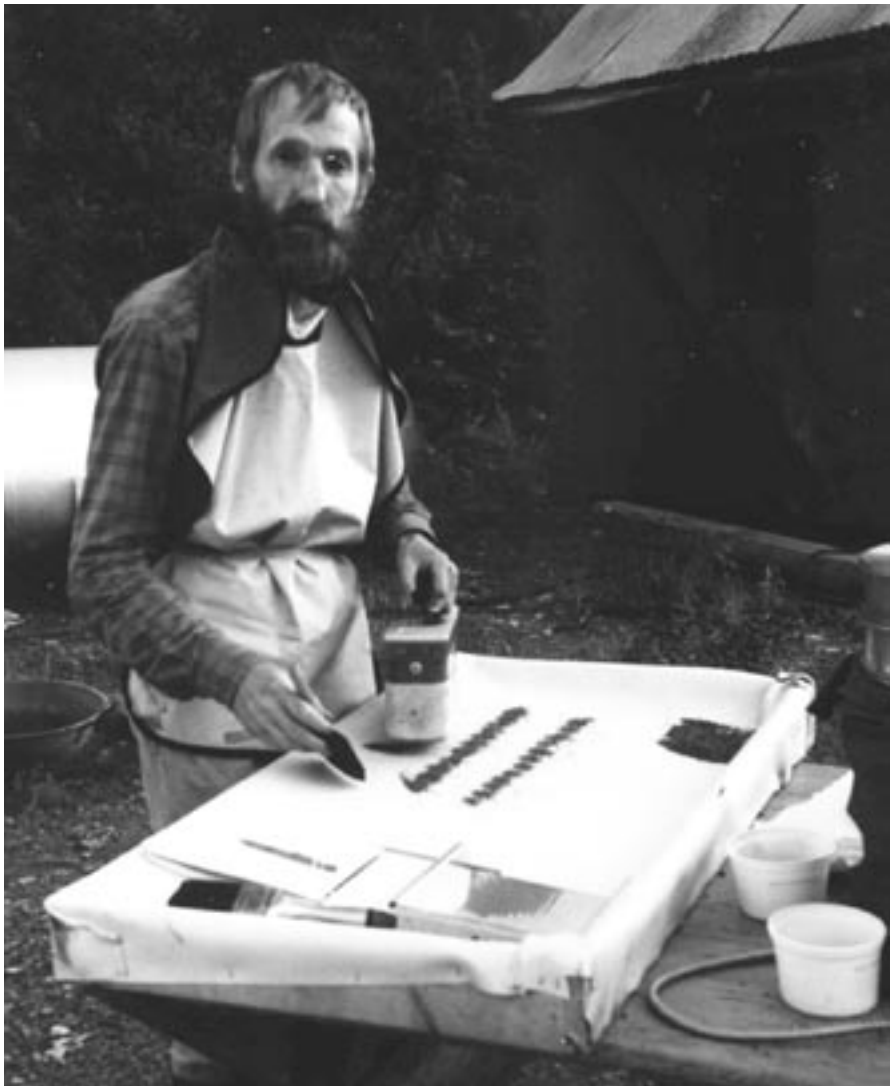
Ductility and Malleability

Gold is the most ductile of all metals, allowing it to be drawn out into tiny wires or threads without breaking. As a result, a single ounce of gold can be drawn into a wire five miles long. Gold's malleability is also unparalleled. It can be shaped or extended into extraordinarily thin sheets. For example, one ounce of gold can be hammered into a 100 square-foot sheet. (Excerpt from The Gold Institute.)

Photo above: *Natural Resource Officer inspecting claim stakes. — Yukon Government photo*

Exploring for Gold: From Hand Tools to High Technology

One of the first phases in the life of a placer mine is one that some would say is the most exciting – exploration. But along with the excitement comes a high degree of risk. "Placer miners tend to have a built-in sense of wanderlust," says Tara Christie, Executive Director of the Klondike Placer Miners' Association. "We love the thrill of the chase and the chance that we might find something that no one else has ever seen. We tend to be an optimistic bunch."



Yukon mining engineer Randy Clarkson uses radio tracer technology to test the efficiency of gold recovery. — Randy Clarkson photo

That optimism might well be a professional requirement. Placer miners spend many years and thousands of dollars exploring areas that may or may not support a placer mine.

"Exploring for gold provides no income," says Christie. "Most of us borrow money to pay for exploration, in the hope that we'll eventually establish a mine and start making money."

Placer miners are not only looking for the presence of gold. They must also find it in enough quantities to make a mine economical. The good news for placer miners, and for the environment, is that developments in exploration technology have provided new high-tech exploration tools.

In the early days, miners would dig a shaft down to the bedrock, tunnel out from there and hope for the best. Today, placer miners do background research long before they head out into the bush. They study Yukon Geological Survey maps showing information about glacial history, geology, geochemistry and geophysics. They visit the mining recorder's office to determine if land has any other claims upon it. Once they're in the field, they do extensive testing, drilling and trenching, often over a period of years.

"This kind of isolated testing is much less disruptive to the environment," says Christie. "As well, today's placer miners know that much of the easy-

to-find gold is gone. We want to ensure an area is economical to mine before a project gets too far along."

A valuable high-tech tool has been the radio tracer technology developed by mining engineer Randy Clarkson of New Era Engineering in Whitehorse. Particles of gold are irradiated at a very low level, and then inserted into the gravel. Clarkson is then able to measure the number of radioactive gold particles pulled out of the ground by the test drill. This measures the effectiveness of the drilling and helps placer miners improve their exploration methods.

The Yukon Geological Survey (YGS) also carries out research on placer deposits, including those in geological settings that have not been historically considered to have high economic potential.

An example of this is the Survey's work in alluvial fans and fan deltas. They are created when creeks "fan out" and empty into a body of water, like a bigger creek, or a lake. As the water slows down, the heavier gold can no longer be carried by the stream, so it comes to rest on the stream bed, forming a placer gold deposit.

"The apex of the fan has good potential and is the easiest to mine," says YGS placer geologist Bill LeBarge. "But newer studies also show it can pay off to mine farther down the fan and up the valley. In some areas, gold has been found in pre-glacial gravels under lake sediments. We have found similar stratigraphy in other places, so it's likely others could mine successfully there."

Some miners are moving into this kind of "non-traditional" mining area. Others are pleasantly surprised to find gold in areas that have already been heavily mined.

"In 1993, we staked claims in a very busy area of the Klondike on Dominion Creek," says Christie. "The mine we built there sustained us for five years. It was encouraging to discover that there is still gold to be found right in front of us, in a very traditional mining area."

The Survey's research is available to all placer miners to help them decide where and how to mine. But placer miners must also rely heavily on their own knowledge.

"There are a lot of variables to consider," says Christie. "We use our own geological knowledge, plus we have to consider things like road access, proximity to town, and even if the kind of equipment we own will work well in that area."

Once those decisions are made, the placer mine moves into the next phase… production.

Infrared (Heat) Reflectivity

Gold is the most reflective and least absorptive material of infrared (or heat) energy. High purity gold reflects up to 99% of infrared rays. This makes gold ideal for heat and radiation reflection, as in life-saving face shields for astronauts and firefighters.

Photo above: *Gold dust and nuggets. — Yukon Government photo*

Working the Goldfields — A Family Affair

If a new acquaintance told you that he made his living in a family business located in a rural area of southern Canada, where he spent a lot of time working outdoors, often operating heavy equipment, you might guess he was talking about a family farm. But if that same person was a Yukoner, you might well think of placer mining.

Placer mines have often been called the family farms of the North. The placer mining lifestyle offers benefits and challenges very similar to those experienced by farmers.

"Farmers work to ensure the good health of their land and their animals," says Mike McDougall, the President of the Klondike Placer Miners' Association. "We work to ensure our equipment and structures are safe, so the environment is kept healthy."

Yukon placer miners and Canadian farmers both share a short "growing season" – the summer months, when much of the key work must be done. This intense period of work creates a lifestyle which again shares many characteristics with the family farm.

"Placer mining families often live right on the claim," says McDougall. "Our eldest child arrived on the claim at just six weeks of age. Having your family close by is one of the great things about being a placer miner. You can have lunch every day with your children."

Lifestyle was part of what drew Mike McDougall back to placer mining after a hiatus of four years in southern Canada. In 2000, McDougall left his mining operations near Dawson City and established a business in Kamloops, B.C.

Jamie Christie assists other family members with panning at Dominion Creek. — Christie photo

"But we missed the people and the place and the lifestyle," says McDougall. "I kept coming back to poke around my old property, even though I wasn't working it anymore. I found myself spending just about as much time here as in the south, so we decided it was probably time to come back."

The involvement of families often leads to multiple generations of placer miners. McDougall is a second-generation placer miner himself, as is Tara Christie, the Executive Director of the Klondike Placer Miners' Association.

"All of our family members are partners in our operation — my parents, my brother and his wife, and myself," says Christie. "The kids help out where they can. Typically, the children start out learning how to do small jobs, and eventually graduate to running the big equipment. My 8-year-old niece recently learned how to clean out the sluicebox plant, earning $2 per cleanup. My own dad taught me how to weld

and fix things. It's a very satisfying experience to pass knowledge down to your children that way."

In the Yukon, placer mines are virtually all family-run, but extra workers are often hired on to help. The smaller operations might consist of just one miner and a helper. The largest placer mine currently operating in the Yukon employs about 20 workers during the summer season.

"Even with the recent ups and downs in the placer mining industry, we're still a key contributor to the Yukon economy," says McDougall. "Placer miners hire local workers and buy local goods. Our industry is definitely a major contributor to the territory's economy."

The Yukon Geological Survey estimates that the 125 placer mines that operated in the Yukon last year employed about 400 workers and generated about 600 jobs in related service and hospitality sectors.

"Because placer mines are family operations, they have staying power," says Christie. "Placer miners tend to tighten their belts and stick it out during tough times, instead of packing their bags and leaving." This personal investment can be seen in the longevity of the placer mining community. Some families have been in the Klondike since the Gold Rush.

The family operation is also a pragmatic structure, says Christie. "Decisions can be made quickly and close to the ground, because all the shareholders live and work on the mine site."

Some of those decisions might involve how best to comply with regulatory requirements in the Yukon.

Next we'll focus on how such regulatory requirements affect today's placer mining.

Thermal Conductivity

Gold is also an excellent conductor of thermal energy or heat. Since many electronic processes create heat, gold is necessary to transfer heat away from delicate instruments. For example, a 35 percent gold alloy is used in the main engine nozzle of the Space Shuttle, where temperatures can reach 3300° centigrade. Gold alloy is the most tenacious and long-performing material available for protection at these temperatures. (Excerpt from The Gold Institute.)

Photo above: *Examining various minerals in the sluice. — Yukon Government photo*

Imagining a Placer Mine

Meeting regulatory requirements to ensure mining is done in a responsible way is now a regular part of doing business in today's mining work. It is a necessary challenge that all Yukon placer miners must face. In order to do so successfully, placer miners need time, fortitude and imagination.

How much time? The Yukon Water Board advises most placer miners to build about four months into their planning process for completing regulatory requirements.

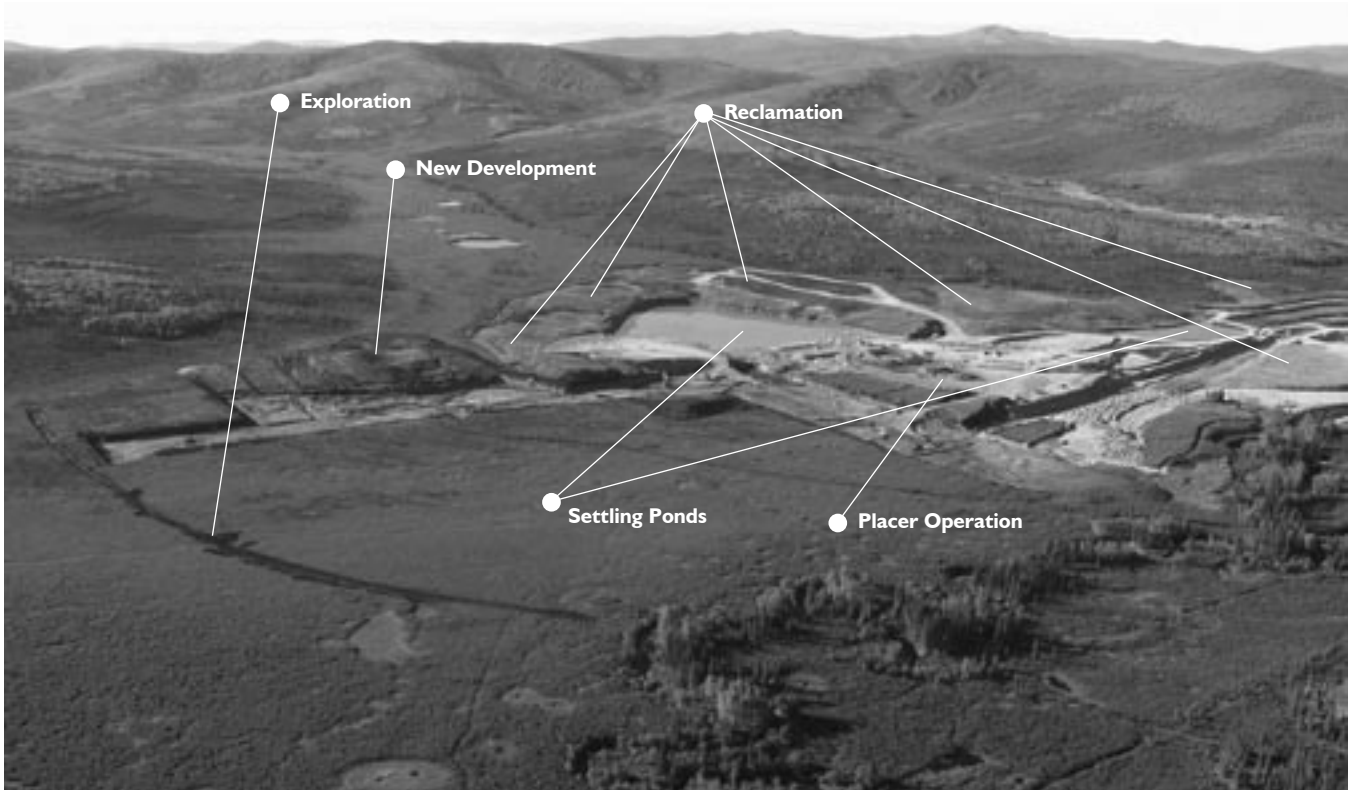
How much fortitude? Enough to face down and fill out the 63-page application form that gets them started on the permitting process.

How much imagination? Enough to be able to visualize the placer mine they want to build, how it will operate and everything that will be needed.

Placer miner Tara Christie has been living and working around placer mines for most of her life.

"The permitting process can be somewhat onerous," she says. "It's a huge amount of work to make all your plans and anticipate all your needs. It's important to give yourself lots of time. In fact, in the case of a new site that my family's placer mining company is moving onto, we did our permitting several years ago to make sure everything was in place in time."

Land and water regulations are designed to ensure mining is done in a responsible way that safeguards the environment and promotes the use of modern efficient technology and reclamation practices. They are common practice across North America



Overview of Ross Mining on Dominion Creek shows the operation, settling ponds, reclaimed areas, exploration drilling and new development. — Bill LeBarge photo

and have become a part of doing business in today's world.

Most placer mining operations require a water use license and approval of a Class IV Mining Land Use Operating Plan. To get either, a third process must take place, an environmental assessment. These processes are run simultaneously by the Yukon Water Board.

"We know the size of the application package can be a little intimidating," says Dianna Mueller, Licensing Officer with the Board. "But it does consolidate and harmonize three separate processes, in order to simplify things as much as possible. We've also done our best to make the form as clear and easy to understand as possible. As well, we are very willing to give assistance to anyone who needs it. We'll even take collect calls."

For each application, the Water Board develops an extensive distribution list, usually of 25 to 30 different parties. The list includes government departments, First Nations in whose traditional territory the project is located, nearby trappers or outfitters, and non-governmental organizations such as the Yukon Conservation Society and the Yukon Salmon Committee. There is also newspaper advertising. Any interventions are considered when the Board meets to decide on the application. The permits for the license and approval, if they're given, usually last for five or ten years.

Some placer miners also need to obtain permits and approvals from other agencies. For example, they would need to go Transport Canada if they want to put a bridge over navigable waters.

"Most of the time, staff at the Water Board have a pretty good sense of who the other authorizing agencies are, so we can tell miners where the other permits are available," says Mueller.

The regulatory environment that placer miners work in today has changed greatly since the early days of mining in the Yukon. Even the past 30 years have seen great changes, says Tara Christie.

"Recent experience has been with a fairly heavily regulated industry," says Christie. "It wasn't always that way. Prior to 1975, there was very little regulation of placer mining. The industry has been practiced in the Yukon for more than a century, but the concerns about land, water and the environment have only come to the fore in the last few decades. This has brought about huge changes for the industry in the operational procedures, lead times and costs of placer mining."

Once all the necessary permits are obtained, placer miners are able to begin operating, but they continue to work to meet a number of conditions. They can expect regular inspection visits from natural resource officers to ensure everything is ship-shape.

Uses for Gold

Gold's superior electrical conductivity, its malleability, and its resistance to corrosion have made it vital to the manufacture of components used in a wide range of electronic products and equipment, including computers, telephones, cellular phones, and home appliances.

Photo above: *Tara Christie at the family placer mine. — Christie photo*

Inspecting Yukon Placer Mines — An increasing record of compliance

A regular occurrence in the life of any placer mine is the mining inspection visit that comes several times a season from one of the eight natural resources officers employed by Yukon Energy, Mines and Resources (EMR). Even the loneliest and most isolated of placer miners expects them to visit at least twice, and often more than that, between April and October.

"Miners generally have a very cooperative relationship with the natural resources officers," says Tara Christie, the Executive Director of the Klondike Placer Miners' Association. "The officers often have good advice that helps placer miners stay in compliance with the various regulations and licensing conditions." This cooperation is part of what has helped produce high compliance amongst placer miners in a number of areas.

Max Fuerstner's Swede Creek mine near Mayo. — Yukon Government photo

Statistics for the past ten years show that placer miners have done a good, and increasingly better, job of meeting requirements in both water quality and restoration work. Compliance has been 90 per cent or better for most years.

In 2003, 99 per cent of placer miners met their effluent discharge standards and 95 per cent of them did all the restoration required by their license. (Effluent discharge is the water that goes back into the stream after being used in the mine.)

"I think a lot of people don't understand how well placer miners are doing in meeting environmental requirements," says Rob Thomson, Northern Area Manager of Client Services and Inspections for EMR. "The industry is highly-regulated by government, and they are doing a good job of meeting standards."

The average number of inspections at each placer mine per season is three or four. Officers try to visit during start-up, a couple times during the production period and then again close to the end of the season.

"The number of inspections varies with the level of activity at the mine and whether any problems are being experienced there," says Thomson. "A reliable placer mine that has a well-established history of compliance may only get the minimum two visits. Others will get more. We try to spend our energy where it's most needed."

Natural resources officers, called mining inspectors in the past, spend a few hours at each site during each visit. They speak with the miners, ask questions, takes notes, walk around the mine site, take water samples and sometimes take photos or video.

Their overall goals are to ensure that mining has no adverse effect on the

environment and important fish habitat, and that the mine can be restored to the same state of utility that existed prior to mining. During a mine visit, officers look for site stability and for compliance with applicable legislation, regulations and the terms of any permits.

"We check to see that the channel, bed and banks of any streams are stable. We don't want to see slumping banks or water draining into a stream across a freshly-stripped area," says Thomson. "If a new channel has been built to divert a stream from its natural course, the new channel has to be large enough and strong enough to withstand the rush of water that could come through during spring melt or a summer storm." The inspections also include a stability check of any protective berms, settling ponds or dams.

The officers are also very interested in the way the mine is using water. Placer mines wash gravels through water, looking for the heavy gold that settles out in the washing process. But they have to meet the water use conditions set out in their water license. The inspection is to make sure that the mine is not using more water than the license allows, and that the effluent discharge is not clouded with too much sediment.

"We also look for reclamation efforts," says Thomson. "Sometimes certain restorative activities must take place at the end of each season, while others can't happen until the miner is completely finished mining at that site."

When a natural resources officer does find non-compliance, there are several routes to take, including verbal or written warnings, or a stop-work order.

"We can also issue a ticket, which is a way of informing the miner that we're investigating possible violations that could end up in court," says Thomson. "But our most effective tool is the officer's authority to issue directions to the miner, requiring certain measures to be taken to fix the problem. Most placer miners want to comply and we find that good communication solves the vast majority of problems."

However, this doesn't mean it's always easy. Thomson says meeting stringent water quality standards can be a challenge. Next we'll take a closer look at how and why water quality is measured at Yukon placer mines.

Uses for Gold

Gold has extraordinarily high reflective powers that are relied upon in the shielding that protects spacecrafts and satellites from solar radiation and in industrial and medical lasers that use gold-coated reflectors to focus light energy. And because gold is biologically inactive, it has become a vital tool for medical research and is even used in the direct treatment of arthritis and other intractable diseases. (Excerpt from The Gold Institute.)

Photo above: *Natural Resource Officer using a water pod instrument to collect and analyze water quality. — Bill LeBarge*

The Quality of Water

One of the main jobs for today's placer miners is to protect the quality of the water that runs through and near their mine sites. Water samples are taken by territorial natural resources officers several times every season from placer mines throughout the territory. Those samples are then analyzed in a Yukon Energy, Mines and Resources (EMR) laboratory in Whitehorse. Nearly all of them end up in front of the same man – Mark Nowosad, the Placer Sediment and Water Quality Technologist at EMR's Client Services and Inspections branch.

Nowosad sees a lot of water. He analyzed 581 placer mine water samples in 2003. Since 1997, he estimates analyzing approximately 5000. But far from tiring of the work, Nowosad is captivated by it.

"My main interest is sediment," says Nowosad. "And how sediment behaves when it gets wet. In plain terms, our lab looks at the physical characteristics of water and mud."

Of special concern is the amount of sediment in the effluent discharge - the water that returns to the stream after being used in the mine. Water samples are taken of the discharge itself, as well as points upstream and downstream. The samples are collected in 1-litre water bottles, similar to the type you might take to the gym or on a hike.

Nowosad carries out a number of tests on the samples, looking in particular for the concentration of solids that hang suspended in the water, as well as the solids that settle to the bottom. He also measures temperature, pH, electrical conductivity and turbidity – how cloudy the water is.

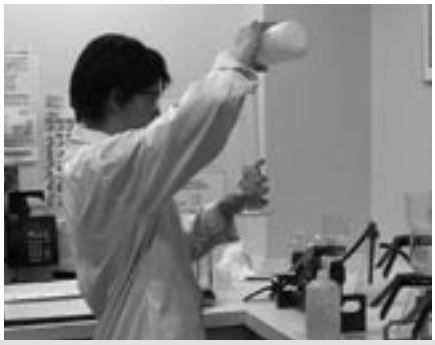
"Different types of sediment take longer to settle," says Nowosad. "Heavy particles like sand will settle in under 40 seconds, but silts can take up to eight hours, and clays even longer, sometimes days. Some sediments never settle, because of the electrical charge they contain or the effect of other particles."

Placer miners are allowed to increase the solids concentration in water by a certain amount, depending on the sensitivity of the fish habitat.

"Our water testing is important for a variety of reasons," says Nowosad. "Suspended sediments can affect the respiration, eating habits and food sources of fish. Settled sediments affect fish beds and breeding areas. Some of the other measurements can indicate whether the water could cause problems for other animals or humans."

Water is used on a placer mine primarily to wash the gold out of gravel as it travels through a sluiceplant, but it can also be used to excavate new areas by blasting away the permafrost. The water then becomes muddy. Usually,

Placer Sediment Technician Mark Nowosad sampling water at Mechanic Creek. — Yukon Government photo



the placer miner "cleans" the water by running it through a series of settling ponds, usually driven by gravity, before discharging it back into the stream. But innovations are also being tried.

"Some miners can build closed systems," says Nowosad. "Water is recycled through the mine again and again, eliminating the need to discharge large volumes into the stream. However, you need lots of space for the ponds, and more money is required to buy pumps and diesel fuel."

"In addition, recycling water means more wear and tear on equipment," says Tara Christie, the Executive Director of the Klondike Placer Miners' Association. "And if it's not monitored carefully, the recycling system can decrease the recovery of gold. As well, some miners in narrow valleys don't have sufficient space to build recycling systems. So while recycling can be an option, it's not always workable."

Nowosad and his co-worker Tanya Gates analyze placer mining water samples for two main purposes. One is to assist in the mining inspections process by determining whether a mine is complying with water quality standards.

The other is to add to the database that allows them to research how mining sediments affect water quality in the Yukon. So far, their results are very encouraging.

"Our research shows that other non-mining sources of contamination, such as surface water run-off, landslides and rainfall, all had a greater influence on degrading downstream water quality than did effluent discharge from placer mines," says Nowosad. "Sometimes placer settling ponds can even help out Mother Nature by catching sediment water from big rainfalls or floods."

Statistics from 1989 to 2003 show a marked improvement amongst placer miners in meeting effluent discharge standards. For the first six years, 80 to 88 per cent of miners were in compliance. For eight of the last nine years, it's been 90 per cent or better, and reached a high of 99 per cent last year.

"It makes sense that placer miners would want to comply with water quality standards," says Nowosad. "They live in the same environment where their mine is located. They and their good friends and neighbours often use the same water that runs through the mine. It's in their best interests not to affect the water quality."

Summertime is high season for placer miners, and their sluiceboxes are working hard these days to retrieve gold.

Meaning of Gold

"Au" the chemical symbol for gold, from the Latin "aurum" meaning "shining dawn." Aurora was the roman goddess of dawn. Chryso is the Greek word for gold. In English, a "crysophile" is a lover of gold. (Excerpted from: www.goldfever.org)

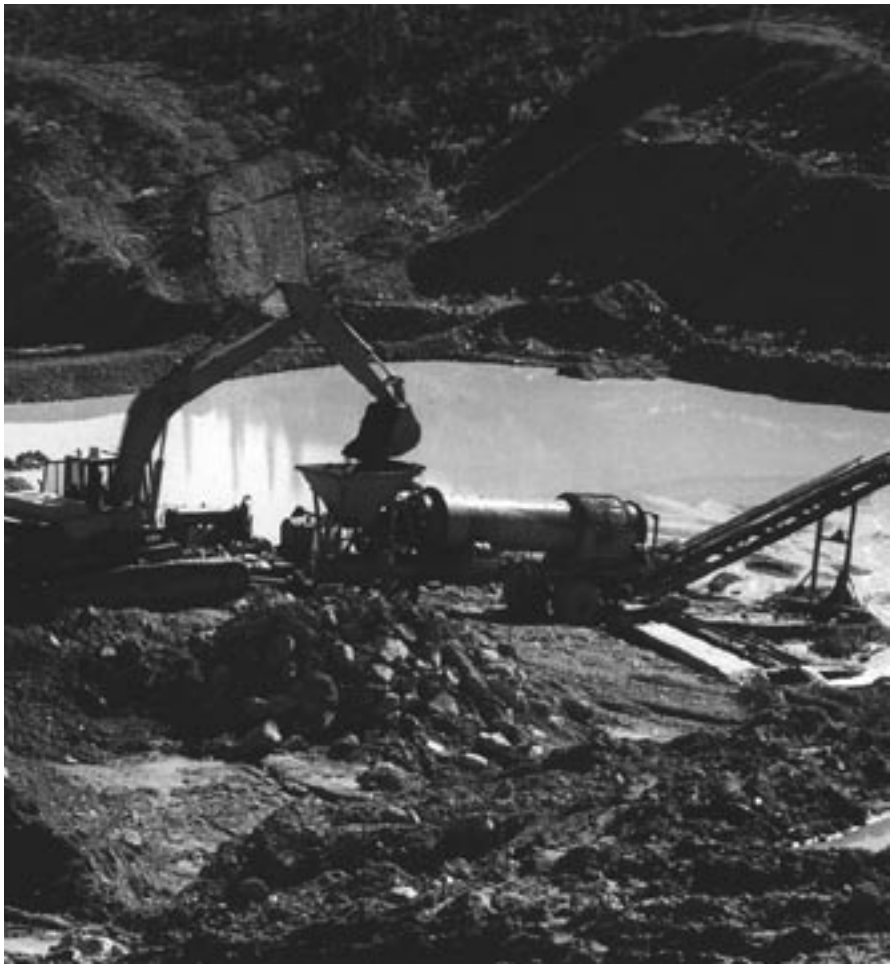
Photo above: *Water quality analyst with Yukon government analyzes water samples for silt and clay content. — Yukon Government photo*

Placer Mining — The Creative Use of Heavy Metal

June is a busy month for placer miners, and Bill Trerice's operation in the Yukon's Mount Nansen area near Carmacks is no exception. When a helicopter full of visitors arrives at Trerice's Back Creek mine on a morning in early June, there's a lot going on.

A bulldozer pushes mounds of dirt within reach of a stationary back hoe or excavator, which shovels it into the near end of the sluice plant. It's then fed into the hopper – a kind of funnel that directs the dirt into a rotating barrel called the trommel.

Jets of water nudge the rocks and mud along at various points, until they reach a set of screens at the far end of the trommel. This is where the larger rocks (everything about the size of a football, or bigger) are fed up into the stacker, a conveyor belt which drops them to the ground. A bulldozer periodically pushes them out of the way.



Placer miner Bill Trerice working at his Back Creek minesite. — Yukon Government photo

Meanwhile, smaller rocks head into the sluice runs, where the heavy particles of gold are separated out. Water runs out of the sluiceplant and into a series of settling ponds built along the creek valley.

The heavy equipment, pumps, rushing water and falling rock all make for plenty of noise and activity. All this is being managed by just two people, Trerice and his one hired hand.

"Two- or three-person mining operations are very typical," says Stephen Colp, Natural Resources Officer for Client Services and Inspections at Yukon Energy, Mines and Resources. "But even though there are only two people working here, they need a lot of equipment."

Trerice has a variety of small and heavy machinery standing at the ready. His "small" operation includes two bulldozers, two excavators, one loader, various pumps, generators, welders, fuel storage tanks, tools and spare parts.

"In a small operation, you never throw anything away, even if you don't have an immediate use for it," says Trerice. "You can almost always use it eventually. It's too expensive to buy new every time you need something."

Colp points out a creative use that Trerice found for old trommel pontoons. He now uses them as a barrier around his fuel storage site.

Like many placer miners, Trerice is an admitted jack-of-all trades. He not only runs the equipment, he often builds, re-builds and repairs it. In the case of his sluiceplant, he purchased the trommel and built the rest of it using existing equipment over a period of about a month.

Although it's an accomplishment some people would never dream of attempting, Trerice downplays it.

"A lot of it is trial and error," he says. "I used to make adjustments and changes to my sluiceplant every spring, or sometimes every month. You learn from experience and from other people. You look at other sluice plants, you remember the things you tried that didn't work, and try not to make the same mistakes. It helps if you like making and fixing things, and don't mind getting dirty."

A sense of humour also comes in handy. "There's an old saying in placer mining," says Trerice. "You can make a small fortune, as long as you start with a big one."

The Executive Director of the Klondike Placer Miners' Association, Tara Christie, agrees that Trerice's mine is typical of small placer operations in a number of ways.

"Placer miners invest an enormous amount of money in equipment, long before they see any gold. They use their own money or mortgage their own homes. And since the equipment is only used for about a hundred days a year, miners keep it going for a long time by repairing, rebuilding and recycling."

The key piece of heavy machinery, the sluiceplant, is not something you can buy off the shelf.

"Every mine site is different, so each sluiceplant is also unique," says Christie. "You have to know what will work on your site, and modify your plant to fit. Lots of work goes into design, development and installation of your sluiceplant."

Creativity and innovation are key ingredients, says Christie. "If placer miners need something, they dream it up and they build it."

Placer miners use their machinery to search for paydirt, of course, which includes gold and other minerals. Next we'll look at what they find and how those minerals are eventually used.

Gold Nuggets

An authentic gold nugget is considered a gemstone because of its rarity and beauty. The rarest form of gold is a nugget. The largest known nugget is called the Welcome Stranger. It weighs about 70.8 kg. It was accidentally uncovered, from just below the surface of the ground, by a wagon wheel in Victoria, Australia, in 1869. (Excerpted from: www.goldfever.org)

Photo above: *Pre-washed and screened materials go through a trommel. — Bill LeBarge photo*

The Use of Gold — From Yukon Creek Beds to Outer Space

Anyone who has admired the jewelry fashioned from nugget gold knows at least a little about what placer miners are searching for and where it eventually ends up. But nugget jewelry, and in fact nuggets themselves, are just a portion of what placer mining is all about.

The nuggets familiar to most of us are only rarely found. Instead, the majority of Yukon placer miners are mining for pieces of gold that are much tinier.

"Most of what we find is smaller than grains of rice, sometimes as fine as sugar," says Dawson City placer miner Stuart Schmidt. "Most gold was originally broken out of a quartz vein. Some will still be in crystalline form but it's usually smoother and more rounded, after being subjected to the pounding it gets in the stream bed from other rocks and sand. Occasionally we get unusual crystalline forms that are very beautiful, resembling miniature gold leaves. These are rare and sought after by collectors."

A gold nugget is anything over half an ounce, and pays better than the smaller pieces. Nevertheless, most Yukon placer miners tend to make their living from recovery of gold grains.

"Nuggets seem impressive, and finding a few can seduce you into looking for more," says Schmidt. "But it's really best to focus on finding larger quantities of gold, even if it comes in smaller sizes."

Yukon gold nuggets. — Yukon Government photo

Pure gold is never found. It's always alloyed with other minerals, usually silver. Most Yukon gold is about 75 to 85 per cent pure, with the rest being silver and other trace elements. Both the gold and the silver have economic value.

"Placer miners sell to refinery agents or gold buyers," says Mike McDougall, the President of the Klondike Placer Miners' Association. "Their find is turned into a miner's bar, which is a rough melt of the raw gold, including all the impurities. The miner gets an advance from the local gold buyer and pays a royalty to the government."

Refineries in southern Canada and the United States smelt the gold and assay it to find the percentage of pure gold and silver, before the remainder of the payment is made to the miner.

Once the gold is sold, it can be used in a variety of ways.

"We all know that gold is used for jewelry, coins and gold bars," says McDougall. "But it also has many high-tech applications. It's a building block for many of the technologies we rely upon. Gold is used in making electrical contacts and switches. Skyscraper windows are electroplated with gold.

It's used in components of satellite dishes, computers, telecommunications and other electronics."

The Gold Institute's website www.goldinstitute.org has an impressive list of the uses of gold. It's used in everything from televisions and VCR's, to airplanes and spacecraft, to firefighting gear and food freshness sensors. There are also a number of medical and dental uses.

Although gold and silver are currently the main minerals Yukon placer miners are selling, there is some potential to recover and sell others.

"Because gold is heavy, it's often found with other heavy minerals," says Stuart Schmidt. "When you're exploring for gold, you take note of the other minerals that tend to be deposited in the same areas, because they're considered markers for gold. These include pyrite, magnetite, galena and others. But in general, most Yukon placer miners are not recovering enough high-quality minerals of this kind to bring in much income."

It's also possible for placer miners to recover copper, platinum, tin, tungsten, titanium and even gems like diamonds, garnets or hematite, known as Alaska black diamond.

"In some areas of the world, placer miners have found enough of some of these minerals to make it worthwhile to recover them," says Bill LeBarge, placer geologist with the Yukon Geological Survey. "Some Yukon placer miners are also investigating the possibility of mining for other minerals. It has the potential to make a marginally-economic gold mine into something more lucrative."

Minerals are not all that is found when placer miners excavate the ground. They also often come across ancient bones and artifacts. Next we'll look at how placer miners have contributed to our body of knowledge about the Yukon's past.

Price of Gold

South Africa is the world's leading supplier of gold. Gold reached an all-time high price of US$800 per ounce in 1980. (Excerpted from: www.goldfever.org)

Photo above: *Gold smeltered from concentrate at Gladstone Creek. — Bill LeBarge photo*

Mining the Past — Signs of Ancient Life Unearthed by Placer Miners

In July 1991, a heavy equipment operator working for Ross Mining near Dawson City hit pay dirt that had nothing to do with gold. In addition to the usual load of mud and gravel, he had scooped up a piece of ivory – a tusk. He dug a little further and found bones. It turned out to be the nearly-complete skeleton of a woolly mammoth.

It was just one of many significant discoveries made on Yukon placer mines over the last century. In fact, such finds form the core of several important fossil collections in the Yukon and elsewhere.

"We were able to halt our work in that area for a week or so and get in touch with the Yukon Paleontology office," says Norm Ross of Ross Mining. "They extracted the skeleton, crated it up and removed it for further study."

Mammoth tusk from Last Chance Creek. L to R: D. Froese, L. Olynyk, S. Armstrong. — G. Zazula photo

The unearthing of Ice Age skeletons may seem exotic but for many placer miners, it's all in a day's work.

Ross says it's fairly common to find tusks, horns, teeth, skulls and bones, sometimes thousands of years old. As miners search for gold, they dig into ancient layers of gravel. Within those layers are clues to the way life was lived in the Yukon a very long time ago.

"The mammoth bones were found in a layer of gravel that is twenty to forty thousand years old," says Ross. "Some of the formations we work in are even older, up to eight hundred thousand years old."

Placer miners must make the most of their short summer working season, so their main concern is to make every day as productive as possible. But it's not uncommon for miners to halt work to allow paleontologists and archaeologists access to new discoveries.

"These finds can be very exciting," says Ross. "Because we're mining, we're exposing fossils and artifacts that otherwise would never be found. These things are frozen into the permafrost, so they are very well preserved. Many placer miners take pride in the contributions we've made."

Discoveries made on placer mining claims have helped to build a base of knowledge in paleontology and archaeology in the Yukon and across the country as well.

"About 90 per cent of the Yukon's fossil collection comes from placer mining finds," says John Storer, Yukon Paleontologist. "These finds have been hugely important in piecing together the story of the Ice Age in Canada."

Storer appreciates the cooperation and hospitality shown by many placer miners who have helped him and colleagues from elsewhere.

"Placer miners save material of interest for us, sometimes even making sure it stays frozen, which is important for some DNA studies. They have allowed paleontologists and archaeologists to work on their mine sites, even adjusting their work schedules to accommodate us."

One of Storer's best memories is of the work he did at Thistle Creek, on Stuart Schmidt's placer mine south of Dawson, and south of the Indian River. The find was rich in fossils of plants, insects and mammals, including horse, mammoth, chipmunk, ground squirrel, vole, lemming, pika and shrew.

Research on such fossils can go on for years. The information is published in academic journals, books and popular magazines, as well as being used in museum exhibits. The fossils themselves become part of Yukon or Canadian collections and sometimes end up on display at the Beringia Interpretive Centre or other museums in the Yukon and elsewhere.

The Canadian Museum of Nature is one such institution. "Our Yukon collection includes tens of thousands of specimens," says Dick Harington, curator emeritus at the museum. "About a third of those were found on placer mines. Miners have made quite a contribution."

A famous example is the horse found by placer miners Lee Olynyk and Ron Toews on Last Chance Creek near Dawson. Dating back twenty-six thousand years, it was so well preserved that portions of the front leg, hide, mane and tail were intact, as well as parts of the stomach and its contents.

Harington also notes several important discoveries on placer mines near Dawson that shed light on human development in the Yukon. One was an eleven thousand-year-old antler tool, used for shaping stone tools, found on Hunker Creek on the ground of John Erickson and Herman Leidtke. Another was a thirty thousand-year-old bison bone found at Nugget Gulch on the ground of miners Bernie and Ron Johnson. It has a fracture evidently made by a human who wanted to expose and eat the marrow.

"These finds are important because they are amongst the earliest signs of human activity in the Yukon and North America, and they were found with the help of placer miners," says Harington. "Discoveries continue to be made every year and placer miners are generally very aware of what to do to ensure the finds are well looked after. This is invaluable to our work."

Oceans of Gold

There are about 10 billion tons of gold in the world's oceans; however, there is yet no known way to economically recover it. (Excerpted from: www.goldfever.org)

Photo above: *A morning's collection of fossils at Tatlow mine, Quartz Creek. — Yukon Government photo*

Training the Placer Miners of Tomorrow

Tyson Knutson at his family's Last Chance Creek mine. — Knutson photo

When Martin Knutson looks around his placer mine on Last Chance Creek near Dawson City, he sees lots of potential for the future.

Knutson's two sons work on his mine, as well as several other young men of about the same age. Every summer, they are able to earn money and gain skills that they might eventually use on a placer mine of their own.

This summer, eight youth from the Dawson area had the opportunity for a similar experience through a training program sponsored by the Klondike Placer Miners' Association (KPMA) and the Tr'ondek Hwech'in First Nation.

Knutson, who is a Director with the KPMA, was one of the organizers of the pilot project.

"The community of Dawson City does a lot to support placer miners, and we wanted to give something back through this program," says Knutson. "We wanted to create an opportunity for Dawson youth to experience mining at an entry level."

Entry level jobs in placer mining are harder to come by now than in the past. With advances in technology, some jobs that used to give youth a 'foot in the door' no longer exist.

"In the past, young people would start with something like box tending," says Knutson. "A box tender uses a huge rake to pull larger rocks through

the sluicebox so they don't get stuck. Now that most placer miners use more complex sluice plants, that job has virtually disappeared."

As a result, when placer mine owners are looking for employees, they want someone with experience.

This summer's training program offered Dawson youth ages 16 to 25 a chance to spend a week working on a placer mine, gaining experience in a variety of onsite jobs. They also attended three classroom sessions, which covered staking and placer mining rules and regulations, job readiness and resume writing, and workplace safety.

"The KPMA received valuable help from other professionals in the community who delivered classroom instruction," says Knutson. "Our partnership with the Tr'ondek Hwech'in First Nation was also very important. Their staff visited the school, talked to young people about the program and took applications."

The First Nation paid half the wages which trainees received. The other half was paid by the placer mining companies for whom trainees worked.

Depending on circumstances at each mine, the trainees' experience included maintenance, mechanical work, carpentry, machinery operation and sluicebox cleanup.

Eight trainees were placed at eight different placer mines. Seven of them were First Nations youth.

"That level of participation indicates a keen interest and support for placer mining from the Tr'ondek Hwech'in First Nation," says Knutson. "It was an excellent partnership opportunity for us."

Knutson's own placer mining crew is 50 per cent First Nation – his two sons and three others.

17-year-old Kyle Isaac is one of those three. He has worked on Knutson's placer mine for two summers and enrolled in the training program this year to gain additional experience.

"It was good to see how another mining operation is set up," says Isaac. "I also spent part of my training week learning to run the backhoe, which is a new skill for me and will be very useful."

Isaac, who is a member of the Tr'ondek Hwech'in, hopes to continue working in placer mining and eventually have his own mine.

The Executive Director of the Klondike Placer Miners' Association, Tara Christie, is pleased to see the level of interest in the training program, especially from First Nation youth.

"Placer miners are very interested in recruiting more young workers who are local and are likely to want to stay on for the long term. And with land claims now settled for many Yukon First Nations, there are new opportunities developing for First Nations people on their own lands."

The training program took place in early June, so that trainees had time to look for summer work afterwards. Several of them did receive continuing work on placer mines. "The program helped to build connections between placer miners and youth," says Knutson. "That might lead to work opportunities down the road as well."

Measuring Gold

The weight of gold or gold articles is usually expressed in troy ounces. (1 troy ounce = 1.097 ordinary ounces.) The purity of gold articles is generally described in three ways: percent (parts of gold per 100), fineness (parts of gold per 1000) and karats (parts of gold per 24). (Excerpted from: www.goldfever.org)

Photo above: *Yukon Geological Survey summer student examines the riffles in a floating trommel plant at Fourth of July Creek. — Bill LeBarge photo*

The Final Stage — Decommissioning a Placer Mine

When a new placer mine is being planned and established, the miner puts energy and thought into ensuring the mine has a long and profitable life. But modern placer miners must also use those early days to think far ahead to the time when the site is no longer profitable to mine and must be closed down.

This last stage in the life of a placer mine is called decommissioning, when the miner carries out final reclamation efforts and prepares to leave the area for good.

Completing the decommissioning of a placer mine can easily take up most of an entire mining season. But the plan must be in place from the beginning, and some reclamation work often takes place every year.

Tara Christie and her family have been mining on Dominion Creek near Dawson City for a decade. This is their final summer at the site.

"Like many other placer mining companies, we've been doing partial reclamation all along, as we finished working certain areas," says Christie. "It's much more efficient and economical. As well, one of the conditions for receiving your water license and mining land use permit is to have a good plan for decommissioning your mine in a progressive way."

Placer miners have several key goals when carrying out decommissioning. First, they want to re-contour the land to a state that is aesthetically pleasing, has no hazards for wildlife or humans, and is likely to re-vegetate. The land should also have a utility comparable to what it had previous to mining. Miners also want to rebuild the stream channel so that it's stable, similar to the original stream and not subject to erosion.

A reclaimed mining pond on Dominion Creek near Dawson City. — Christie photo

Meeting each of these goals requires significant skill, planning and money.

"In order to restore the land, today's miners stockpile any layers of earth that were moved," says Christie. "This could include gravels, topsoil, peat and vegetation. When you're finished mining, you put the ground back with the peat and topsoil on top, the way that it would naturally occur. You might also take extra measures to re-contour hillsides. For example, you might run machinery across a hillside to create grooves, which help seeds and vegetation become established."

The miner must also remove everything that was brought to the mine site – machinery, equipment, tools, fuel tanks, scrap and buildings. "It can be quite a daunting task to move so many large items, such as buildings, that in other contexts would be considered permanent."

Placer miners often build a new stream bed in order to re-direct a stream through it, allowing them to mine under the original channel. Depending on circumstances, the stream may later be restored to its original course, or it may continue to run through the new channel. Either way, there are a number of considerations for the miner.

"You need to make sure the stream banks can hold during floods," says Christie. "The channel has to be a similar length as before, with bends, water velocity changes and rock groupings. The objective is to create stable healthy streams with good fish habitat."

Regular mining inspection visits take place at placer mines every season and placer miners get advice during these visits from the natural resources officers employed by Yukon Energy, Mines and Resources.

"The officers are familiar with each mine's decommissioning plan, and they can advise miners about whether what they're doing is acceptable," says Christie.

Even with this help, reclamation is still an expensive part of mining. Christie estimates that about 20 per cent of overall placer mining costs go to reclamation and site cleanup.

Reclamation efforts are far better now than in the early days of mining. "In those times, not a lot of thought was given to planning for the end of the mine's life," says Christie. "That started to change in the late 1980s. Now reclamation planning and work happen right from the beginning."

Although Christie says the improvements have occurred across the board, certain miners have been singled out for their extraordinary attention to reclamation. These include Norm and Sandra Ross of Ross Mining on Dominion Creek near Dawson City. In 2001, they were awarded the Long Time Achievement Award for Placer Reclamation by a selection committee of government and placer mining representatives.

"They received the award for the annual reclamation work they've done since they began placer mining in the early 1980s," says Christie. "Their responsible mining practices have been far more than was required by legislation or regulation. They have really gone the extra mile."

Outstanding quartz and placer reclamation practices are also recognized annually through the Robert E. Leckie Awards. After a selection process carried out by a committee of Yukon government and industry representatives, the awards are presented to mining companies, placer operators and others who go above and beyond the normal call of duty in responsible mining and reclamation.

When a placer mining company is finished with decommissioning, it has often already begun mining at a new site. Next we'll look at what happens when a placer miner is starting over.

Purity

The purity of gold articles may be described in three ways:

- Percent, meaning parts of gold per 100
- Fineness, meaning parts of gold per 1,000
- Karat, meaning parts of gold per 24. Not to be confused with the carat, equaling a fifth of a gram, which is used to state the weight of a gem stone.

(Excerpted from: www.goldfever.org)

Photo above: *Revegetation at Ross Mining on Dominion Creek. — Bill LeBarge photo*

Starting Over — How to Move a Placer Mine

Placer miners spend many years and many hundreds of thousands of dollars developing their mine sites. They do this in the full knowledge that at some point, there will not be enough gold left at the site to make mining worthwhile. If the miner wants to continue making a living, that means shutting down one mine and starting fresh at a new site.

That's the kind of summer it has been for the Christie family and their company, Gimlex Gold Mines. The family has been closing their mine site on Dominion Creek near Dawson City. After ten years, it's time to move on.

"We've been progressively moving to our new mine site on Indian River, also near Dawson," says Tara Christie, who is a partner in the family operations and also serves as the Executive Director of the Klondike Placer Miners' Association. "We've really been working at two mine sites all summer, winding one mine site down, and getting the new one set up."

The Christies have known this move was coming for some time, so they began the process of obtaining the proper permits years ago. "Permitting is one thing that can be done well in advance," says Christie. "Winter is a good time to do it, so it doesn't cut into the actual mining season."

One of the key tasks for a miner who is starting over is to learn as much as possible about the new site. Drilling must be done to determine the depth of gravels and other materials, and to define the layers of earth. The miner wants to know which layers contain the most gold, how deeply the gold is buried and how coarse or fine the gold is likely to be.

"We'll often do a test pit or test cut to confirm the amounts of gold we expect to find," says Christie. "We'll also do test sluicing to ensure we are using the right equipment and screens, so that we get an effective recovery of gold."

Another big job is establishing the mining camp. This is a monumental task that might appear virtually impossible to those of us who dread a relatively simple move from one house to another. In the case of a placer miner's move, there is no house to move into. There may not even be a dry level patch of land to build upon. The work can sometimes begin with something as basic as constructing a gravel pad to hold the camp.

"Building a mine site is like starting from scratch," says Christie. "Usually placer miners need to construct or install everything they'll need, including the septic field, power, water, roads, culverts and drainage."

This summer, the Christie family has picked up all the collected

A camp building is loaded onto a truck during the Christie family's move to their new placer mine site. — Christie photo

paraphernalia of their lives and their business, and is busy moving it from one mine site to the other. This includes a house, two house trailers, two bunkhouses and a kitchen, a roofed walkway and a workshop. Then there are the "smaller" items, such as the swing set, picnic tables, trampoline, propane tank, welding equipment, pumps, hoses and spare parts.

The house and house trailers must be emptied of most of their contents, and then all of that must be trucked to the new site as well.

"We're moving literally tons of stuff," says Christie. "There are many, many truckloads of belongings that are going to the new site. We're even taking things like our raspberry bushes and rhubarb plants."

In addition to all this, there is yet another challenge to be dealt with – when you're doing a move this big, there's not much time left to do any actual mining.

"During a moving year, you have to understand you won't make much money," says Christie. "You have to plan ahead for a year of low income and high expenses."

Although the Christies have spent a good part of the summer working on the move, the job is so big that it will likely extend into next summer as well. By that time, they'll be eager to put aside the moving crates and get back to the business of placer mining.

Purity of Gold

European system:

- 100.0% gold = 1000 fine
- 91.7% gold = 917 fine
- 75.0% gold = 750 fine
- 58.3% gold = 583 fine
- 41.6% gold = 416 fine*

Karat system:

- 100% gold = 24 karat
- 91.7% gold = 22 karat
- 75.0% gold = 18 karat
- 58.3% gold = 14 karat
- 41.6% gold = 10 karat*

* The minimum amount of gold that a product can be composed of and carry the label "gold", according to the U.S. Federal Trade Commission "Guides to the Jewelry Industry".

Photo above: *Gold bar. — Bill LeBarge photo*

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