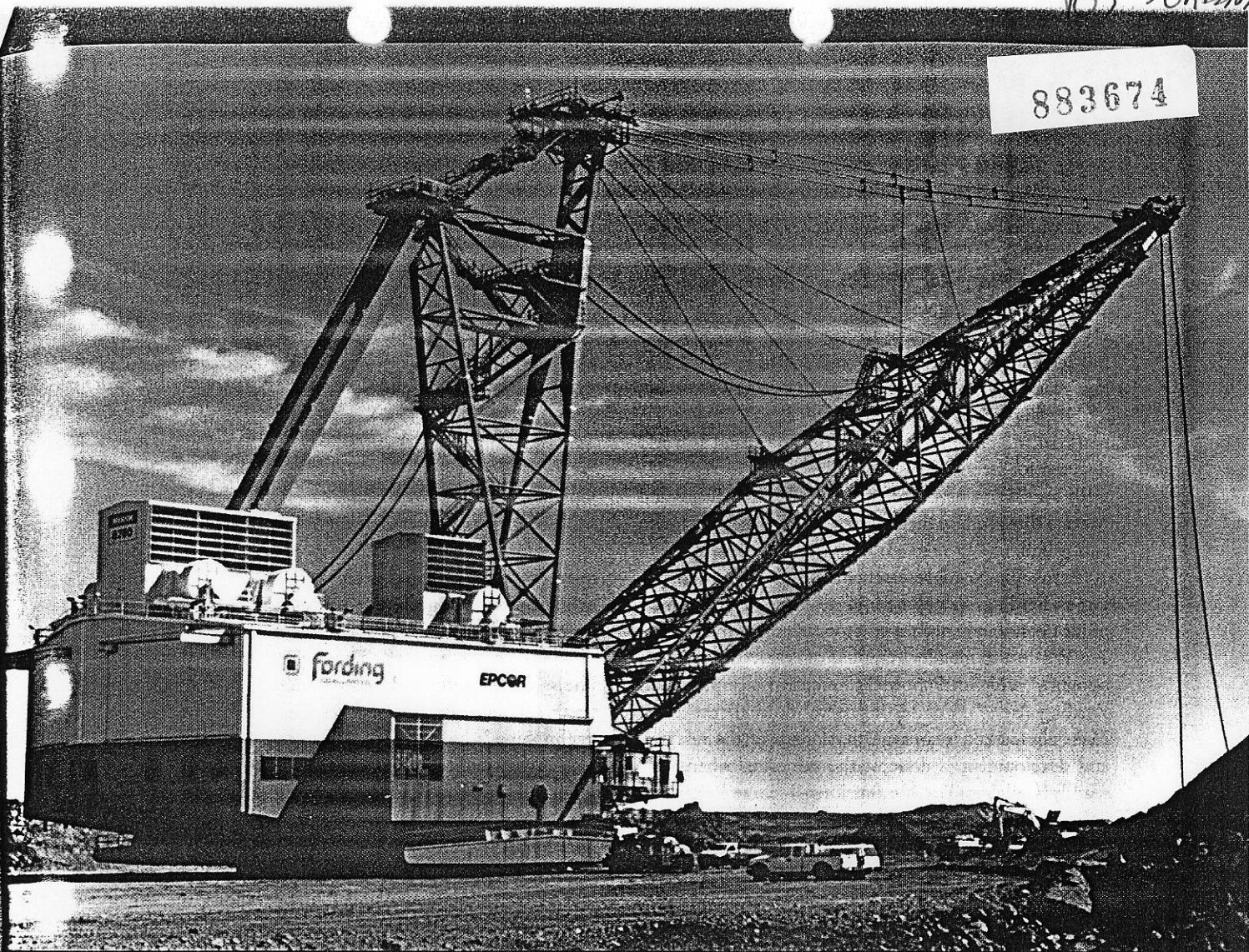


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# Canada's Black Gold

## MOUNTAINS OF COAL MEAN PROFITS FOR FORDING

Fording Inc. is Canada's largest export-coal producer with the capacity to supply more than 20 Mt of metallurgical and thermal coal products to Canadian and global markets. The company has come a long way since its early days with a single mine and its aggressive pursuit of its operational objectives of productivity improvements and cost-effectiveness will ensure its ongoing success in the steel and energy industries.

by Heather Ednie

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**F**ording was established in 1968 when project evaluations began on the Fording River operation in southeastern British Columbia. Today, the company runs eight operations throughout North America, with its head office in Calgary. Last October, following reorganization of Canadian Pacific Limited, Fording became an independent, publicly owned company. Its more than 1900 employees are dedicated to maintaining the company record of strong return on capital that has led the Canadian mining industry during the past few years.

Fording's massive reserves of metallurgical and thermal coal will allow for opportunities to expand as world demand for steel and cost-effective energy increases. As well, Fording owns subsidiaries in the United States and Mexico that produce the industrial minerals, wollastonite and tripoli.

Across the board, research and development is ongoing as Fording operations look to increase production, reduce costs, and enhance environmental performance.

"We do a tremendous amount of research and development," said Jim Popowich, executive vice-president, Fording Inc. "We're testing new ideas all the time. Most equipment is so large that much of the research and development is done at the minesites where it is readily available. The bottom line — we're helping to define state-of-the-art technologies for our particular mining situations."

Fording is looking to take advantage of every possibility on the technological side, provided it makes operational and financial sense. Popowich said it's also important to ensure the company is getting very high utilization of the existing capital stock it has before making the jump to new technology. "We want optimal use of the technology available," he said. "Coal is a commodity market, and as such, we must focus on being cost-effective."

On the operating side, utilization of manpower and equipment, and effective use of technology and data are subjects for continuous improvement. For example, GPS technology is used in applications such as truck and shovel dispatching, mine surveying and exploration. The use of this advanced technology optimizes mining and enhances operational processes. As well, Fording pays much attention to the consumables — tires, fuel, explosives, and ground engaging tools — as they are the largest onsite costs.

Fording's focus on technology improvements isn't surprising, Popowich said, as Canadians, in general, are technology users. Whether it's through internal projects or working with suppliers to find ways to lessen the effects of the harsh mining environments, Fording has built its success on innovation and will continue to grow through it.

Always seeking opportunities for growth through making better use of the existing capacity, Fording

strives to optimize its efficient use of capital. The main focus is on opportunities with a high probability of success, where cost reduction will result. "We invest about \$40 million annually in replacements and upgrades which sustain our existing capital," said Popowich. "When we look at investment we approach it on a total systems basis. You must always think in context of the entire system — all elements are part of the bigger picture."

A major asset at all Fording operations is the work force, which tends to be long-service employees. This has a positive impact on the knowledge base. Popowich said the company works to include employees in the decision-making process, and to encourage their input in the operation.

"We understand the need for buy-in from the employees," he said. "The response is great when you give operators the opportunity for input. For example, when onboard computers were installed in some of the mining equipment, the equipment operators were involved in the process. This helped ensure that these tools were configured to meet operators' needs and enabled them to avoid apprehension about using the new technology."

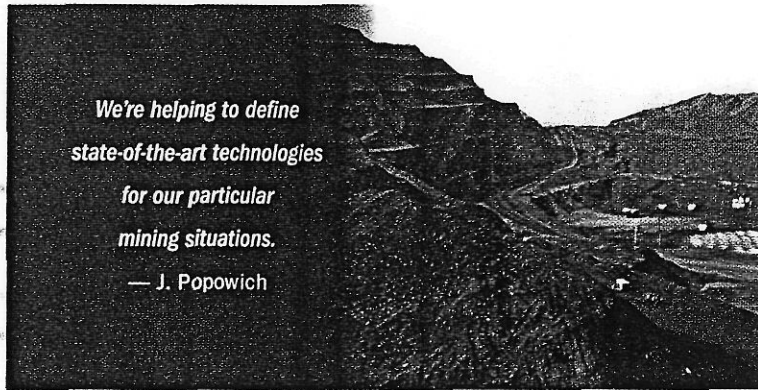
CIM visited four Fording operations — the Genesee prairie thermal coal mine, and the three mountain metallurgical coal mines: Fording River, Coal Mountain, and Greenhills — with the objective of an article covering Fording's operations, technology, and use of innovative operating techniques. At all four operations, the list of recent improvements from cost reduction to new equipment purchases was long. And the schedule of ongoing and planned projects even longer. The effectiveness of reclamation programs at all four operations was obvious, as various stages from site preparation to seeding and tree planting were visible.

For the sake of the article, the focus will be on the mountain mines, though the experience in the control cab of a dragline at Genesee was unforgettable. But metallurgical coal accounts for the largest percentage of Fording production and the indomitable trio is an example of continuous improvement successes.

### **Metallurgical Coal from the Mountain Mines of British Columbia**

Fording River, Coal Mountain, and Greenhills — three large operations located in the picturesque Rocky Mountains. Mining cannot be more magnificent than the vision of Fording River when standing on the peak at Greenhills and gazing across the valley. But it's not just a scenic view at Fording's mountain mines. Together, the three operations produced over 16 Mt of metallurgical coal last year, most to be transported by train to the port in Vancouver for shipment to world markets.





*We're helping to define  
state-of-the-art technologies  
for our particular  
mining situations.*  
— J. Popowich

The close proximity of the three operations allows for a level of knowledge and technology sharing that many other mines do not enjoy. Any new developments, optimizations and new technology at one operation are quickly shared with the other two, avoiding research redundancies and speeding up the improvement process.

The mining methods and mill circuits are very similar at all three operations, though individual geology and mine design lead to some unique characteristics and methods. Each on its own is notable, and together, they make a world-class coal producer forging its way into an even stronger position in the global market.

In pursuit of their global marketing objective, Fording's mountain mines have achieved certification under ISO's 9000 quality management standards designation. "This provides our customers with the strong assurance that we produce and supply coal following high-quality standards," Popowich said.

### *Fording River*

Fording River, the company's flagship operation, is one of the largest mine operations in Canada, producing over 9 Mt of coal last year. Today, the operation employs 825 people. It's a much more productive site compared to 25 years ago when 1600 employees produced 3 Mt of coal annually. The main product is metallurgical coal for use in steel production, but the operation also produces small quantities of thermal coal used in energy applications.

Fording River's reserves are estimated at 217 Mt, which translates into many more years of operation at today's production rates. The majority of reserves are on the east side of the property at Eagle Mountain.

The mine's equipment is getting bigger and more efficient. "We're deal-

ing with big pits," said Kim Barrowman, mine production superintendent, Fording River. "We need more elbow room to keep running — bigger equipment and more flexibility."

This past year, five new Komatsu 930 290 t haul trucks were added to the fleet, which now includes six 930s, 18 218 t Haulpaks, 15 218 t Caterpillar trucks and 15 155 t trucks.

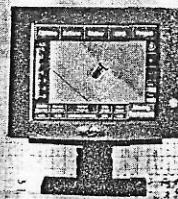
Trucks are loaded by four 46 m<sup>3</sup> shovels, including two Marion 301s, one Marion 351 and a P&H 4100, and two 23 m<sup>3</sup> shovels. Three BE 49R drills are used to prepare mining areas for blasting. Currently, four pits are being mined.

Coal is transported from the mine to a rotary breaker, where large waste rocks are removed. The coal is screened into four separate size fractions, and then cleaned using gravity, cyclone or flotation devices. Waste is discarded as either dry coarse rejects or wet fine tailings. Coarse rejects are hauled to waste spoils, while the tailings are stored in settling ponds before the water is recycled to the washplant. Once washed, the coal is dried in a thermal dryer that uses coal as its primary fuel.

The Fording River processing plant is in the same shell as was built 30 years ago, but ongoing plant improvements have modified the circuits to increase capacity and process efficiency. Cost-effectiveness is the priority.

"We have to be efficient and constantly seek improvements," said Robin Gold, senior mining engineer, Fording River. "For example, we're using coarse plant

## Congratulations Fording Inc.



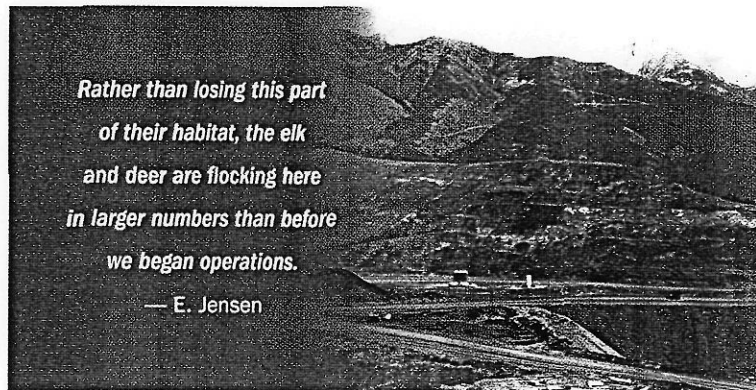
Since 1994, Modular Mining Systems and Fording Inc. have worked together to maximize productivity and increase operational efficiency. In fact, Fording Greenhills was one of the very first mines to use a Modular GPS system for tracking haul truck locations in real time. As a long-time partner to Fording, all of us at Modular would like to say thank you for your business, and we wish you continued success in the future.



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rejects on our roads, which has cut our crushing costs significantly and results in better roads.”

Throughout the workforce, management strives to involve employees in the operational developments. “There is a lot you can do with technology, but you also have to manage your technology effectively,” Barrowman said. “You have to look at everything, go out and address issues and tell the workforce about it. It pays to keep the employees involved.”

The nature of the metallurgical coal market has added challenges to the operation. Customers are getting more particular about the commodities they seek. “Our customers are driven to tight specifications,” said Barrowman. “That means we have more things to consider in our operation, and we have to carefully control our products to meet their requirements.”

### Coal Mountain

Acquired by Fording in 1994, the Coal Mountain operation covers an area about four by two kilometres. Known reserves at the mine are projected to support mining at 2001 production rates through 2015.

“When the operation was purchased, it was necessary to upgrade the mining equipment and wash plant, and widen all the roads,” said Matthew Cole, chief mine engineer, Coal Mountain.

Previously, 91 t trucks were used, so the roads would not accommodate today’s larger equipment. Plant production in 2001 was 2.5 Mt, up from 1.1 Mt in 1995. The operation employs about 175 people.

The mine uses traditional open-pit mining methods, employing two diesel hydraulic O&K shovels, which Cole said, are capable of recovering coal directly from the bank as opposed to handling coal with dozers. Eight 218 t trucks haul the raw coal from the shovels to raw coal stockpiles where a loader selectively moves it to the rotary breaker according to specific blend requirements. Reduced to -2 in. diameter, the coal is then transported by conveyor system to the top of the plant. An overland conveyor carries the clean coal from the plant to load out area where it is loaded into rail cars for transporting to port.

The Coal Mountain operation is surrounded by settling ponds to handle any water discharge from the mine. In the spring, a flocculent is added when needed to handle run-off water if the sediment load gets too high for the ponds to adequately settle out the material.

Coal Mountain uses many viable resources that are available to increase productivity and reduce costs. A quartzite deposit was discovered near the mine and is used for surfacing permanent haul roads.

A waste oil treatment plant was installed where waste oil is cleaned and then blended to be used in explosives. “We save money by decreasing the amount of diesel purchased, and we consume our waste oil,” Cole said. “It’s economic, and environmentally responsible.”

Since purchasing Coal Mountain, Fording has made many improvements to the plant. In addition to adding a new higher throughput breaker in 1996, Fording installed a flotation circuit along with a new distributed control computer system for the plant and dryer. In 1997, a spiral circuit was installed which eliminated the secondary water-only cyclones.

“We engage in ongoing work to increase our response time to variabilities in the feed, and to improve our analyses of raw coal processed and clean coal produced,” said Richard Tremblay, superintendent, processing, Coal Mountain.

### Greenhills

The Greenhills operation, located within sight of the Fording River mine, produced 4.9 Mt of clean coal last year, up from 3 million in 1993. “There’s been a steady increase,” said chief engineer Eric Jensen. “We intend to move forward to match production to plant capacity.”

There are an estimated 110 Mt of reserves identified at Greenhills, which at existing full production, will take more than 20 years to mine.

Two areas are being mined. One, the North end, is being mined in four quadrants. Using this method, it is possible to back-fill from one quadrant to another, resulting in shortened haul distances, and lessening the number of trucks needed to handle the same amount of material.

Four shovels load 25 218 t Haulpak and seven 155 t Haulpak trucks. A 73 m<sup>3</sup> shovel is scheduled for delivery prior to the end of the year. This will be the largest shovel employed at any of Fording’s sites.

As new equipment is added to replace the aging truck fleet, it will be larger — such as the Komatsu 930 haul trucks, Jensen said. One advantage of having Greenhills and Fording River in close proximity is that fleet equipment can be shared between the two mines as needed.



Like the other Fording operations, the roads are a high priority due to concerns about tire wear and truck speed. Crushed rock is used to make Greenhill's roads smooth to maximize truck productivity.

Coal is transported to the breaker and once crushed is separated into three size categories before being washed and dried. The dryer at Greenhills uses either coal or natural gas for fuel.

### Continuous Improvement on a Mountainous Scale

As mentioned earlier, Fording's mountain mines share their technology. A development at one will quickly be examined for possible implementation at the others. Managers from Fording River, Coal Mountain, and Greenhills meet on a regular basis to share knowledge, plan, and discuss issues.

Virtually, all aspects of the operations are touched by improvement efforts, as everything from haul cycle time to tire wear to coal recovery in the plants is constantly evaluated for cost-effectiveness and optimization potential. There are a number of specific areas currently being addressed at each site. GPS technology is optimizing performance in a variety of operational procedures, tire

wear monitoring is increasing tire life, and every circuit within the plants is being tweaked to avoid bottlenecking and increase coal and magnetite recovery. From site to site, one constant won't change — Fording employees are using innovation and common sense to stay on top of the field.

GPS technology is not new to Fording operations. In the early 1990s, Fording was involved in the development of what today is the Aquila system for drills, in partnership with a couple of graduate students from McGill University. The Aquila system is optimizing drill performance at the three mountain mines today by using GPS and advanced communications technology to guide the drill and to measure rock hardness while drilling.

"The Aquila system is used to optimize blasting," said Barrowman. "It picks up the rock hardness as a hole is being drilled, enabling better blast control. There is a very hard band of sandstone in the mine zone (at Fording River), which can cause real challenges for blasting. With the Aquila system, it can be accurately located in each area and blasted accordingly."

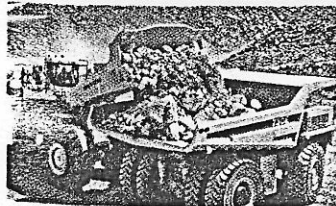
The shovels and loaders are also equipped with GPS systems, which help optimize their performance and improve coal blending. "The shovels are equipped with

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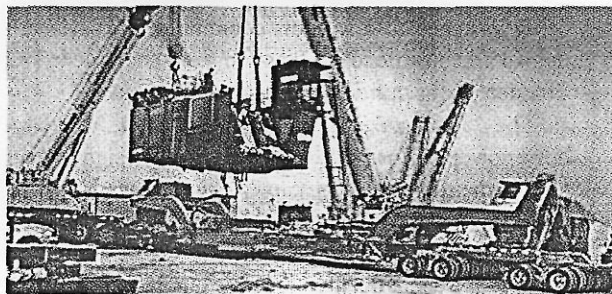
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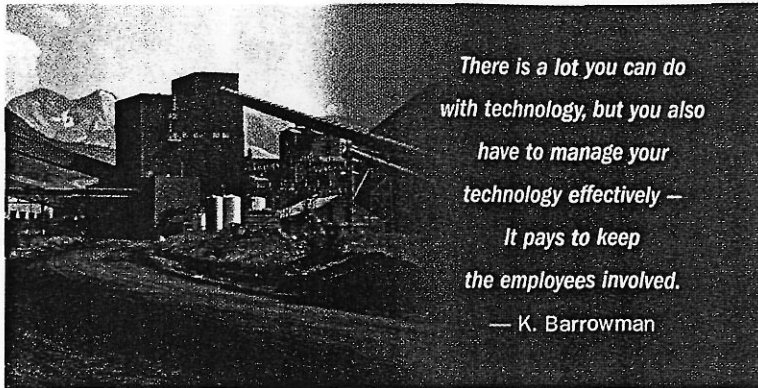


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high-resolution GPS systems, which are loaded with grade data from the pit floor,” Gold said. “It allows the operator to know the exact spot to be excavated, the elevation, and the positioning.”

A joint project involving Fording River, KalTire, and Fuller Brothers is currently developing a tire monitoring system for temperature and pressure, and determining ways to optimize tire life. The Fording River mine-site features some long hauls, reaching up to five kilometres one way, on which the tires will heat up. Recent technology developments have been helping to increase the life of tires, and lessen the chance of tire damage. A sensory ball placed in each tire measures temperature and pressure, then transmits signals to a receiver in the truck. From the truck, that information is sent to an onsite tireman. Plans are to advance this monitoring system so that it provides realtime information through dispatch.

“The industry has discussed the need for a system that will measure the contained air temperature in the tires,” explained Barrowman. “It is good to see the groundwork for such a system being done here at Fording River.”

Many other innovations have been developed at Fording’s operations. For example, at Coal Mountain, a ‘removable coal lip’ was added to the loader to increase the capacity for coal loading. Innovation work is ongoing. “Drills and other equipment at Fording River are being switched to a wireless communications system to upload and download information from equipment,” said Branden Scott, mine engineer, Fording River.

The 218 t haulers have been retrofitted with larger horsepower engines. The original engine design was running at the top end of the curve, which meant higher fuel consumption and greater stress on the system, Popowich said. Increasing the engine size allows the trucks to perform better while decreasing emissions and lowering fuel needs.

A joint-venture digital mapping project between Fording and Golder Associates is looking at using digital cameras to determine aspects of the rock structures to study high-wall stabilities at Coal Mountain. The cameras will produce three-dimensional images of the rock for the mine’s engineers to study. Initially intended for

safety reasons, the technology could lead to more detail and precision in mine planning, said Cole.

At Greenhills, the drill and blast system (DABS) allows employees to capture coal data and provide blasting instructions. The system includes data collection modelling and visual monitoring. “It’s the best drilling and blasting methodology I’ve ever seen,” Jensen said. Currently, work is under way to incorporate DABS into the mine modelling system.

A significant consumable in the plants is magnetite, therefore improving magnetite recovery receives much attention at all the operations and many projects have been carried out to address this issue. For example, the four primary magnetic separators at Coal Mountain were replaced this past year with two larger and more efficient separators which can recover more magnetite.

Like Fording River and Greenhills, the dryer at Coal Mountain has been converted to use either coal or natural gas as fuel. This enhancement enables coal fines to be used as fuel and has reduced natural gas costs at the operation.

The Knelson concentrator, typically used in gold recovery, is currently being tested at Coal Mountain. Testing began at the beginning of July and continued throughout the summer. “We’re evaluating it to see if it will provide greater control of product ash allowing us to alter our classifying and spiral circuits,” said Tremblay. “We’re always looking for equipment that will give us better control when processing the coal.”

### Reclamation to Preserve the Rocky Wilderness

Fording’s mountain mines are massive. Deep in the heart of one of the most breath-taking areas of the Rockies, whole mountains are being mined for their coal. Fording recognizes its responsibility for maintaining the majestic natural environment in the area. Aggressive reclamation programs at all three operations will ensure that at the end of the day when mining is complete, the area will be reclaimed for forestry, wildlife, and recreational use.

Environmental research began at Fording River well before the mine opened in 1972. It was conducted to obtain information on the area’s ecology, including native tree and plant species, local wildlife populations and their behaviour, and physical characteristics of the land and water resources. The knowledge gathered helps guide the reclamation efforts of today.

Fording strives to ensure its impact on the environment is minimized. Settling ponds are designed and built to prevent sediment from entering local streams. Air



quality is monitored continuously, and programs are carried out to control fugitive dust.

Every year, reclamation activities are conducted on waste dumps, landfills, and other disturbed areas to return them to productive forests and wildlife habitat. Refuse and waste rock from the mine are used to build slopes modelled after the natural formation of mountains in the area. Slopes are constructed to mimic the inclinations and land distribution that has been created by the environment over millions of years. After resloping is complete, the slopes are then seeded and trees are planted. Revegetation is done to provide the natural shelter of forests and food source of meadows to accommodate the needs of elk, deer, sheep, bears, birds, and small animals that populate the area.

"In fact, our reclamation work has increased the food source for wildlife, resulting in increased wildlife in the area," said Jensen. "Rather than losing this part of their habitat, the elk and deer are flocking here in larger numbers than before we began operations."

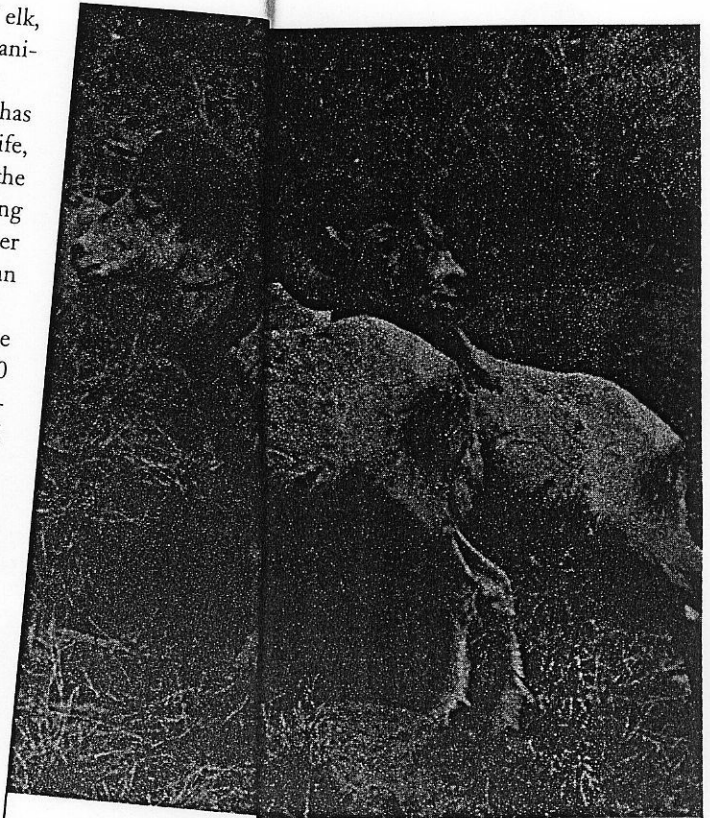
At Fording River, a large greenhouse complex which produces almost 50 000 seedlings annually, is operated year-round for seedling harvesting for all three of the company's Elk Valley mines. Several varieties of native coniferous and deciduous trees are grown for planting on a large scale to accommodate the mines' needs.

"At Coal Mountain, we plant about 5000 to 6000 seedlings each year," said Cole. "Reclamation work is an integral part of our business plan."

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