COAL ENVIRONMENT

IN THIS MODULE

ENVIRONMENT

COAL AND OUR ENVIRONMENT

The Ancient Greeks believed that everything in the world was composed of some combination of the four elements: earth, air, water and fire. These four elements still define our environment today. As such, they provide a framework for the environmental issues being tackled by Canada's coal industry. Initiatives to address land use, waste, air and water quality, wildlife and even noise concerns are currently being implemented in coal-related activities across the country.

Canada's coal industry is actively seeking ways to address environmental concerns on three fronts. The first is **at the mine site** where mining and processing methods are designed to minimize local air, water, land and community impacts. The second is **at power plants** where improved coal-burning technologies have reduced emissions and advanced technologies are promising even greater reductions. The third front addresses the challenges of global cooperation in order to minimize coal's environmental impact **around the world.** On all of these fronts, the coal industry is working cooperatively with government, communities and other stakeholders to ensure environmental initiatives are addressed.

The Cover:
Through the implementation of detailed reclamation plans, mined lands are returned to their prior agricultural, forestry, wildlife or recreational use.

The coal industry, like other Canadian industries, recognizes the interconnections among land, water, air, animals and people. As a result, the industry has focused attention on issues that touch on and link these important elements of our environment.

START CLEAN, END CLEAN

BRINGING LAND FROM SURFACE USES TO MINING AND BACK AGAIN

Reclamation* is a long-term process that combines social sciences, economics, biology and natural habitat* studies. The word "reclamation" may suggest an activity that only happens after a mine is closed but, in fact, reclamation begins long before mining actually starts and then continues throughout the life of the mine and beyond.

Several years before a mine starts, planning begins with environmental impact assessments, public consultations and thorough reviews by regulatory agencies. Environmental specialists start the process by performing comprehensive studies of existing ecosystems* to identify sensitivities and potential impacts. They establish baseline information for surface and ground water, soils, climate, local land use and existing social and economic conditions. This information is used to choose the best site for the mine and to develop environmental protection and reclamation plans for the area.

As part of the planning process, local communities are consulted about the anticipated impact of mining on land use, transportation systems and the quality of life in the surrounding area. Public consultation is undertaken to obtain meaningful input from local residents so that their ideas and concerns can be addressed when developing final reclamation plans.

Besides protecting living resources, emphasis is also placed on documenting or preserving historical resources, including archeological and paleontological sites.

Studying the local environment and planning reclamation initiatives is a time-consuming but very important step in a mining project.

Every provincial government has departments that work to protect air quality, ground and surface water, land, fish and wildlife. The Federal government can also get involved in areas where it has jurisdiction such as fisheries, toxic substances and trans-boundary impacts. These regulatory agencies evaluate every reclamation plan, considering the baseline environmental information and the long-term interests of those likely to be directly affected by the mining project. Actual mining cannot proceed until the company receives permits based on strict environmental standards for land reclamation, protection of wildlife and management of air and water quality. Regular inspections throughout the entire mining process ensure companies adhere to government standards.

Because of the temporary nature of mining, companies actually just "borrow" land for the time it takes to mine the coal. Afterwards, lands are returned to their prior agricultural, forestry, wildlife or recreational use. Ongoing research programs provide information to confirm that reclamation practices are having the desired results. These studies also identify areas where corrections need to be made or where opportunities exist for improvement, so further action can be taken.

* See Glossary

MANAGING SOIL

LAND RECLAMATION IS VITAL TO AGRICULTURE

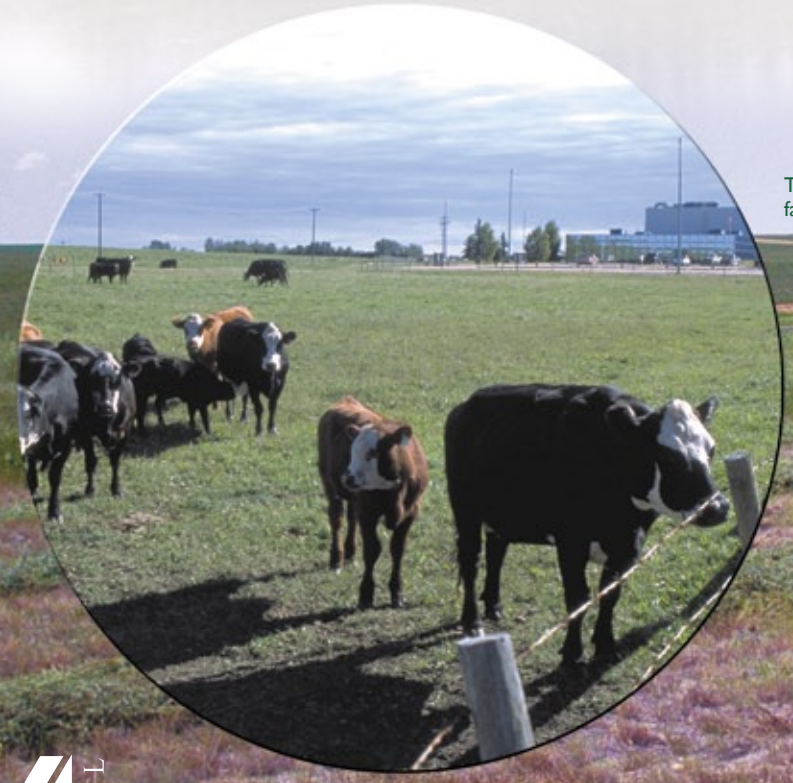
Coal is often found lying just underneath valuable croplands and pasturelands in Alberta and Saskatchewan. As a result, coal companies work hard to mine these lands as efficiently as possible and then return the lands to their pre-mining condition.

At all mine site locations, the biological, terrestrial, atmospheric and aquatic components of the environment are documented. In agricultural areas, environmental specialists pay special attention to crop production and farming practices. Soil maps are drawn to record the characteristics and thickness of surface soils. Surface and ground water patterns are researched. Finally, reclamation plans are developed to enhance surface features for drainage control, crop production, ranching or habitat development.

Surface mining in grain and ranching country is a very systematic process. It's a temporary disturbance of the land to extract the coal because, generally speaking, the land is back in agricultural use within three to five years. Crop monitoring and soil analysis then continue for five years or more, depending on the terms of the reclamation plan approved by provincial and local authorities.

Virtually all of our country's coal production is in western Canada. British Columbia currently has six active mines generating over 38 per cent of Canada's coal production. Alberta, the country's top coal producer, supplies 43 per cent of our coal from eight mines. Saskatchewan has three strip mines producing 16 per cent of the country's coal. Because western Canada enjoys both mining and agriculture as resources, the mining industry returns mined lands to their pre-mining conditions as quickly as possible.

Reclaimed land can be used for prior agricultural uses like pasture land for cattle and crop production.



Three years ago, this productive farmland was a strip mine.

MAINTAINING WATER QUALITY AND QUANTITY

PUTTING FISH AND WILDLIFE HABITAT FIRST

Mined lands are often intersected by lakes, rivers, streams and drainage systems. Coal companies are responsible for maintaining water quality and quantity in and around the locations of their mines. This means minimizing impacts on local waterways, reducing water use and ensuring water used in the mining process is cleaned before being returned to the natural system. Because of these important responsibilities, the coal mining industry has become very experienced in the science of water management. Here are a few of the industry's water management success stories.

At the Fording River mine in British Columbia, a popular fishing stream called Henretta Creek was temporarily shifted to get at the coal underneath. The water was carefully diverted into a culvert and a lake was created downstream to provide more fish habitat. After the coal was mined, Henretta Creek was restored to a new re-constructed channel. Today, this waterway supports a larger fish population than it did before the creek was moved.

At the Coal Valley mine near Edson, Alberta, two recreational lakes have been created on reclaimed portions of a mine site. There is easy public access to the lakes and thanks to the provincial fish-stocking program, the trout fishing is very good. This area has always featured wildlife-friendly muskeg* and wetlands*. Now with the lakes, the area provides a more diverse landscape, offering exceptional recreational opportunities and wildlife viewing.

A new recreational area was created on previously unreclaimed mined lands in west central Alberta. Working with regulatory agencies, the coal industry reclaimed the land and turned it into a new lake. Called East Pit Lake, it has become one of the better local fly fishing spots.

While the goal is to return lands to their pre-mining state, mining reclamation projects often enhance wildlife habitat.

Waterways diverted for mining projects are redirected back to re-constructed paths so fish and other aquatic life are only temporarily moved.

* See Glossary

REDUCING WASTE

MINIMIZING GARBAGE BY REDUCING, REUSING AND RECYCLING

Industries across Canada are making giant strides in waste reduction, and the coal industry is no exception. Many products that once became hazardous wastes after use are being replaced by environmentally friendly alternatives. Other items that used to be thrown away are now being reused and recycled. By-products* once considered waste are being recovered for use in new applications. Here are a few examples of how the coal industry is working to reduce waste.

Items that used to be considered wastes are now being carefully cleaned for recycling and reuse.

At one time, specialized lubricants contained toxic components like lead. After being used, these chemical components made these lubricants hazardous wastes. This meant they had to be handled carefully and shipped to the hazardous waste plant in Swan Hills, Alberta. The cost for such special treatment was $300 per barrel, on top of the cost of regular handling and shipping. Today, many specialized lubricants contain citrus products instead of toxic components. These new lubricants work very well and, once used, they can be safely disposed in a landfill.

Consumable items like batteries and filters that used to be thrown away are now recycled. Hydraulic oils and antifreeze are cleaned and recycled.

Ash—the powder-like material left behind after coal is burned—used to be treated only as a waste product at coal-fired power plants. Now most Canadian coal-fired power plants have taken steps to recycle the ash. Some of the ash—called bottom ash—falls to the bottom of the furnace, where it is collected for removal to dump sites. The remaining air-borne ash—called fly ash*—is removed by electrostatic precipitators, which use an electronic charge to attract the ash, or by a giant vacuum-cleaner system. These processes remove more than 99 per cent of the fly ash. Recovered ash is used as backfill at a mine site or recycled in the manufacture of cement. In cement manufacturing, every tonne of fly ash displaces a tonne of cement. This conserves a primary resource—limestone—and reduces cement manufacturing energy costs.

Fly catching. In a 400-megawatt power plant burning 221 tonnes of coal every hour, 20 tonnes of fly ash would be produced. With an emission control technology performing at 99.5 per cent efficiency, 19.9 tonnes of fly ash would be captured hourly.

Lafarge's plant in Exshaw, Alberta uses high-efficiency, coal-fired burners to manufacture cement. By using fly ash as an alternative raw material in cement production, LaFarge is helping to preserve other natural resources.

* See Glossary

PROTECTING WILDLIFE

KNOWLEDGE AND CREATIVITY LEAD TO INNOVATIVE AND EFFECTIVE SOLUTIONS

The forests and abundant wildlife in Alberta and British Columbia challenge the reclamation talents of mining companies. But with a clear understanding of wildlife protection issues and a lot of innovative thinking, coal companies are coming up with some very workable solutions. Here are just a few examples.

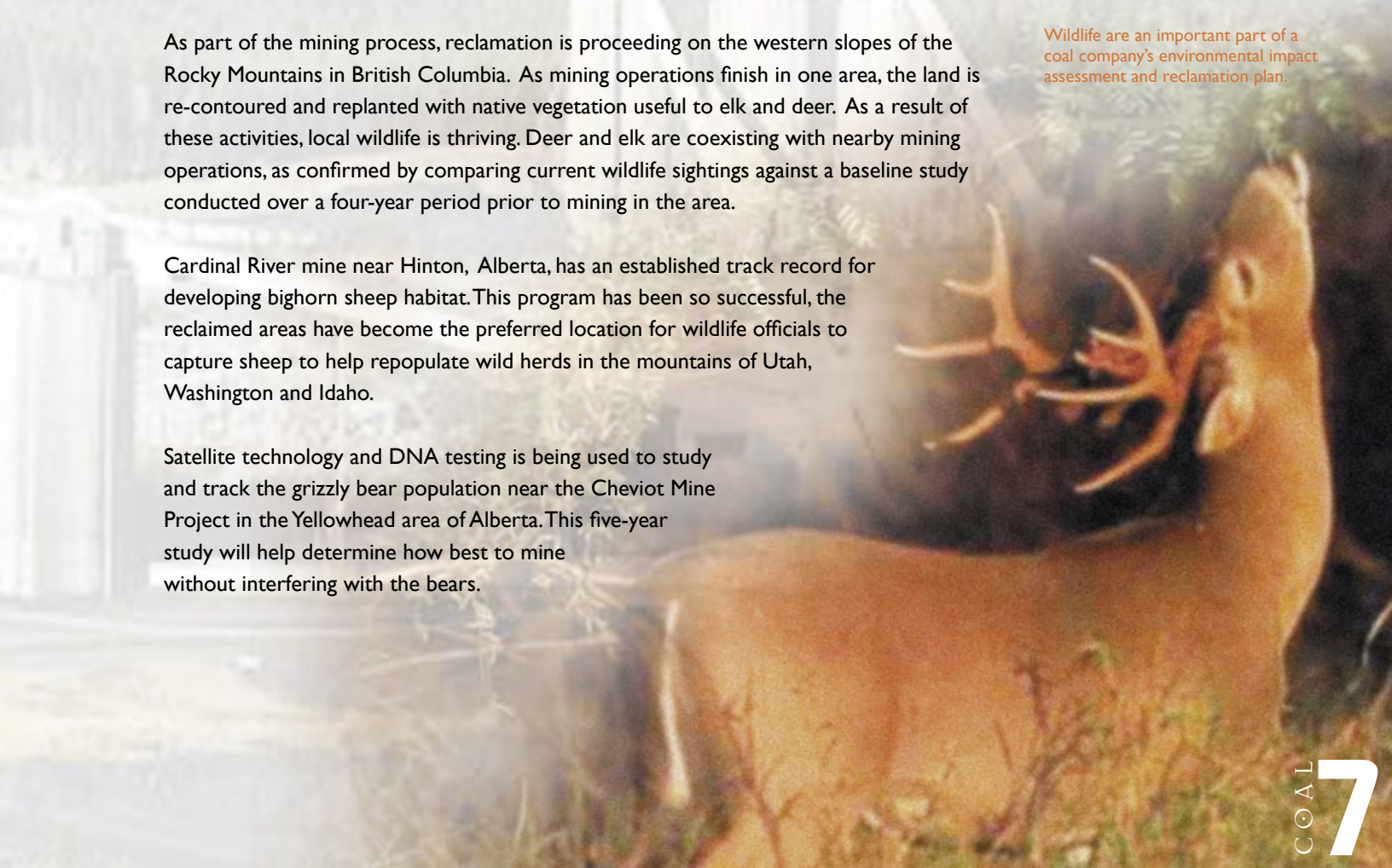
The watershed surrounding Line Creek in British Columbia's Elk Valley is designated as a critical wildlife zone for elk and deer. The mining project planned for the area needed a mine access road and a ground-level conveyor belt to cross the river. However, it was quickly discovered that the conveyor and road could deter animals from getting to the river. The mining company had to find a way to share that stretch of the river valley with the local animals.

First, the slopes on the sides of the mine access road were reduced to make crossing easier. Then, after some creative thinking, the company modified the plan for the conveyor. At major animal crossing sites, the conveyor system was raised to a height of three metres to create wildlife underpasses. Ongoing studies, using infrared light beams and other monitoring systems, show that the deer and elk have adapted very well to this innovative underpass system.

As part of the mining process, reclamation is proceeding on the western slopes of the Rocky Mountains in British Columbia. As mining operations finish in one area, the land is re-contoured and replanted with native vegetation useful to elk and deer. As a result of these activities, local wildlife is thriving. Deer and elk are coexisting with nearby mining operations, as confirmed by comparing current wildlife sightings against a baseline study conducted over a four-year period prior to mining in the area.

Cardinal River mine near Hinton, Alberta, has an established track record for developing bighorn sheep habitat. This program has been so successful, the reclaimed areas have become the preferred location for wildlife officials to capture sheep to help repopulate wild herds in the mountains of Utah, Washington and Idaho.

Satellite technology and DNA testing is being used to study and track the grizzly bear population near the Cheviot Mine Project in the Yellowhead area of Alberta. This five-year study will help determine how best to mine without interfering with the bears.



Wildlife are an important part of a coal company's environmental impact assessment and reclamation plan.

LIMITING NOISE

NOISE - THE INVISIBLE ENVIRONMENTAL ISSUE

The coal industry is subject to a variety of municipal, provincial and federal regulatory guidelines concerning noise levels. These guidelines are designed to protect mine site workers, as well as residents of surrounding communities and nearby lands.

The industry has developed a number of actions to minimize and contain noise. These include developing natural barriers—like berms*—around mine sites, planning haul roads to minimize vehicle noise, and developing and applying new noise reduction technologies.

The Genesee mine and power generating plant near Leduc, Alberta, provides an excellent example of how a noise emission issue was handled effectively. There, the utility company, mining company and local community work closely together on environmental issues. They meet regularly as an advisory committee and share information on plant or mining changes to address community concerns.

One concern involved the challenge of controlling the noise from the huge coal hauling trucks. Powered by 1400 horsepower engines, hauling up to 136 tonnes of coal and moving 24 hours a day, the loud trucks annoyed some of the neighbours during the night. This is understandable; the area is a flat prairie so sounds can travel a great distance, particularly on cold nights. Various mufflers were tried on the trucks but a certain amount of audible sound was still emitted. So the mining company worked with a local manufacturer and together they invented a solution. The resulting mufflers were the size of a freezer, but they did the job.

In response to another community's concerns, the operators of Cardinal River mine built berms as sound barriers. They also turned off the back-up horns on their trucks. Instead of these horns, they used two-way radios between drivers to maintain safety standards.

Determined to be good neighbours, strip-mining operations feature sound abatement programs to limit the noise of heavy-duty equipment.

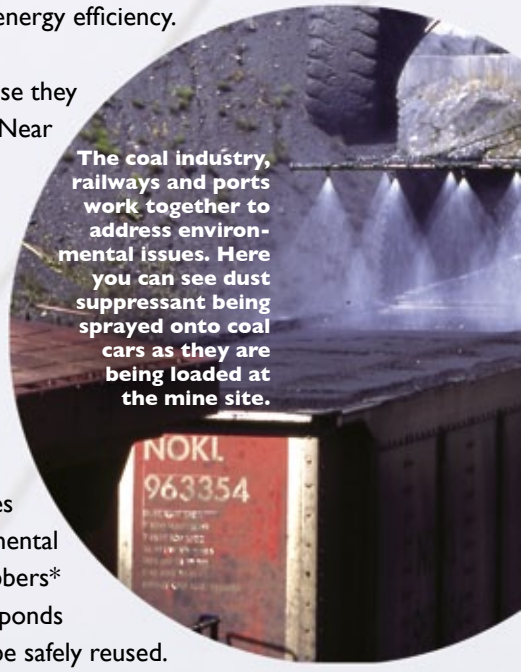
* See Glossary

ENHANCING PRODUCTIVITY

BIGGER OPERATIONS ARE CLEANER, SAFER AND MORE EFFICIENT

Emergency Response Teams protect the environment and serve the community. The coal industry's Emergency Response Teams are well-trained in first aid and emergency response. They are equipped with specialized gear—including ambulances, jaws of life and spill containment systems—to handle both industrial accidents and environmental incidents. In many mining communities, members of the Emergency Response Teams also serve as volunteer firefighters or assist with highway accidents and local area disasters like tornadoes and train derailments.

Mining, like all industries, is about productivity. The most efficient means of being productive is to operate on a large scale. But operating on a large scale is not done purely for business reasons; it's also easier on the environment. For example, bigger haul trucks can carry more coal per trip and deliver more tonnes of product per litre of fuel than smaller vehicles. Huge shovels, loaders and draglines are also optimized for energy efficiency.

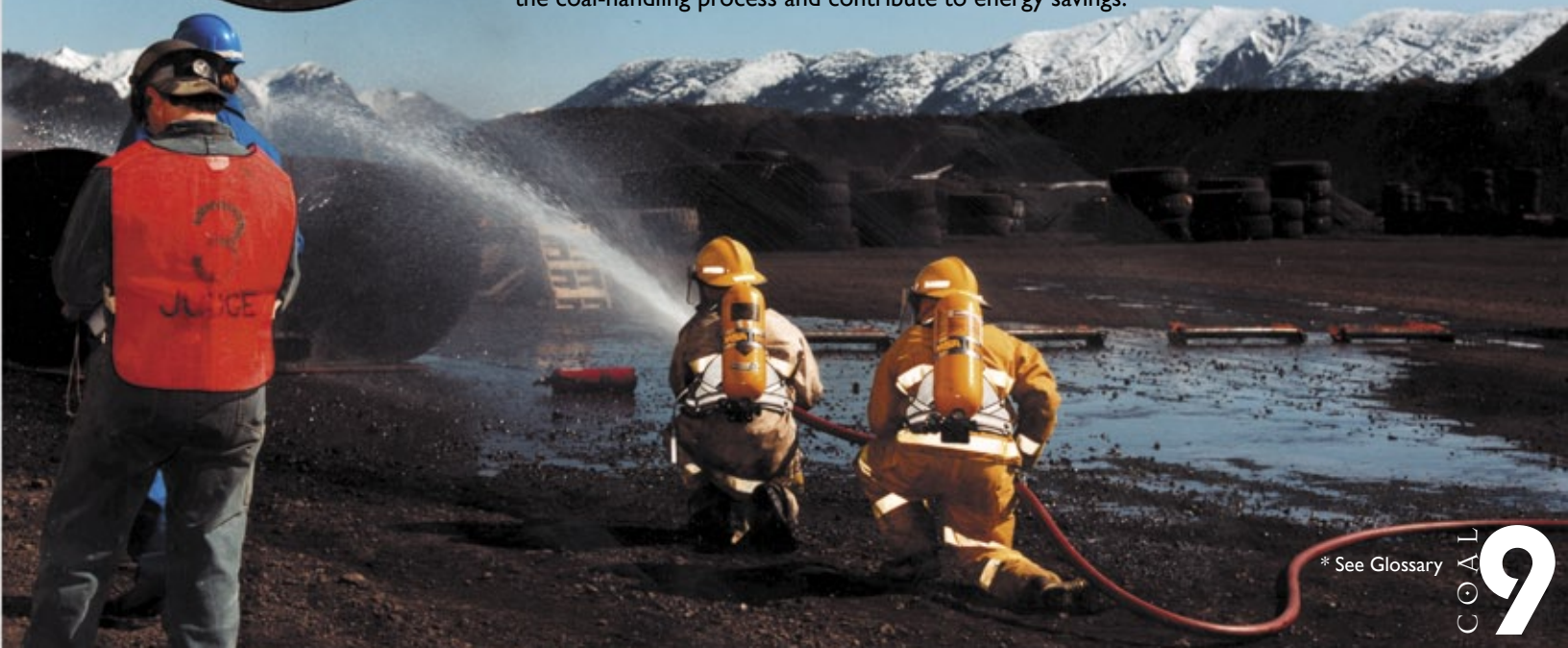


The coal industry, railways and ports work together to address environmental issues. Here you can see dust suppressant being sprayed onto coal cars as they are being loaded at the mine site.

Conveyor systems are used where appropriate because they are quiet, less intrusive, low-energy delivery systems. Near Hinton, Alberta, an 11-kilometre-long conveyor runs straight up the side of Obed Mountain. At the Line Creek mine in the Elk Valley of British Columbia, a curving conveyor system has replaced a truck route through a narrow canyon. More efficient than running trucks long distances, these conveyor systems are also designed to accommodate existing wildlife corridors.

Coal processing plants, train systems and port facilities are designed to be efficient and to minimize environmental impact. Processing plants wash the coal and use scrubbers* to reduce emissions in the coal dryer stacks. Settling ponds settle the dirt out of used water so clean water can be safely reused.

Coal trains are designed to operate efficiently. Even though the trains can be 125 cars long, the aluminum cars are lightweight and therefore need less fuel to pull them. A dust suppressant applied to the coal in the cars minimizes dust blowing off the train. And automated loading and unloading systems at mines and in coal ports streamline the coal-handling process and contribute to energy savings.



* See Glossary

ONGOING IMPROVEMENT

KNOWLEDGE AND TECHNOLOGIES CONTINUE TO DRIVE ENVIRONMENTAL IMPROVEMENTS

The coal industry—in cooperation with government agencies, local communities and other industries like utilities, railways and ports—has developed and implemented a variety of successful initiatives designed to protect and even enhance the local and global environment. Here are just a few of these environmental challenges and solutions.

Something as simple as **coal cleaning**—washing it before shipping and burning—adds environmental benefits. Washing removes some of the ash content and the subsequent drying removes moisture, which reduces weight. Dry, lightweight coal is less expensive to transport and more valuable as a heat source. That's why higher rank thermal coal from Alberta and British Columbia is always washed before being transported to Ontario and abroad.

Reducing sulphur dioxide (SO2) emissions is a big undertaking for the coal industry. Western Canadian coal is already considered a cleaner coal because of its low sulphur content. In order to be ranked as a cleaner coal, the sulphur content has to be less than one per cent; some Alberta coal is as low as 0.2 per cent! With a combination of low-sulphur coal and the technologies used today by coal-fired power plants, western Canadian coal's SO2 emissions are well within Canada's stringent air quality standards.

Electrical utilities in Ontario use low-sulphur coal in their power plants. By choosing this type of coal, Ontario Power Generation reduced the average sulphur content of its coal from 2.4 to 0.6 per cent, which significantly reduced the power plants' sulphur dioxide emissions. The New Brunswick Electric Power Commission cut its SO2 emissions in half by switching from high-sulphur oil to low-sulphur coal.

Fluidized bed combustion is an established power plant technology that reduces SO2 emissions by as much as 90 per cent and nitrogen oxides by up to 50 per cent. Fluidized bed combustion uses a natural chemical reaction to capture sulphur while coal is being burned. The result is that solid materials such as calcium sulphate and gypsum are created and become part of the ash that remains after combustion. This residue can then be safely disposed. As an added benefit, the process allows coal to be burned at lower temperatures, which reduces the formation of nitrogen oxides.

One of the world's largest fluidized bed combustors is used in Nova Scotia Power Corporation's Point Aconi power plant. In comparison to conventional coal-fired plants in the area, this plant delivers a 90 per cent reduction in SO2 emissions and a 65 to 75 per cent reduction in emissions of nitrogen oxides.

When scrubbers are installed in the exhaust sections of coal-burning power plants, limestone particles in the system "scrub" the sulphur to form calcium sulphite or calcium sulphate compounds. These compounds are then processed into products such as gypsum wallboard or taken to appropriate landfills.

Today's modern, coal-fired power plants produce fewer acid-forming gases and carbon dioxide emissions relative to the amount of fuel burned. Although the efficiency of coal combustion has improved 400 per cent since coal was first used as a fuel in Canada, research continues to develop even more productive technologies. By applying new knowledge and technologies, electricity-generating facilities are increasing their efficiencies in two ways: using less coal to produce a set amount of power and generating more power from the same amount of coal.

MANY ENVIRONMENTAL ADVANCEMENTS ACHIEVED, BUT STILL MORE TO COME

The coal industry has demonstrated its determination to mine and transport coal cleanly, in order to reduce local environmental and social impacts. After years of effort, the industry has a long list of positive environmental actions. After coal is mined from a location, the land is returned to productive use. Wildlife habitats are being maintained and restored. Waterways are being preserved. The needs of local communities are being respected. Smarter technologies at mine sites are contributing to energy efficiencies and reduced emissions. Cleaner-burning technologies are coming onstream at new power plants.
Coal is becoming a cleaner-burning fuel.

But this is not a time to rest on laurels. Armed with new technologies, more stringent guidelines and increased scientific knowledge about our immediate environment, the coal industry is continuing to devote time, energy and resources to making all of its coal operations more environmentally friendly.

GLOSSARY

BERM – a wall or mound of earth used as a natural barrier to reduce noise from mining operations.

BY-PRODUCT – something of value produced in making or doing something else.

ECOSYSTEM – a system made up of animals, plants and bacteria interrelated together with their physical and chemical environment.

FLY ASH – the mineral residue produced as a by-product of burning coal. Fly ash is collected from flue gas before it exits the power plant's stack.

HABITAT – the region where a plant or animal naturally grows or lives; native environment.

MUSKEG – a kind of bog or marsh containing thick layers of decaying vegetable matter.

RECLAMATION – the act of restoring mined land to its original agricultural, forestry, wildlife or recreational use by recontouring the land and restoring topsoil and planting native grasses, trees and ground cover.

SCRUBBER – any of several forms of chemical/physical devices which operate to remove sulphur compounds formed as a result of fossil-fuel combustion.

WETLANDS – an area of land characterized by swamps and marshes that is set aside for wildlife.

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MODULE 1: EVOLUTION
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