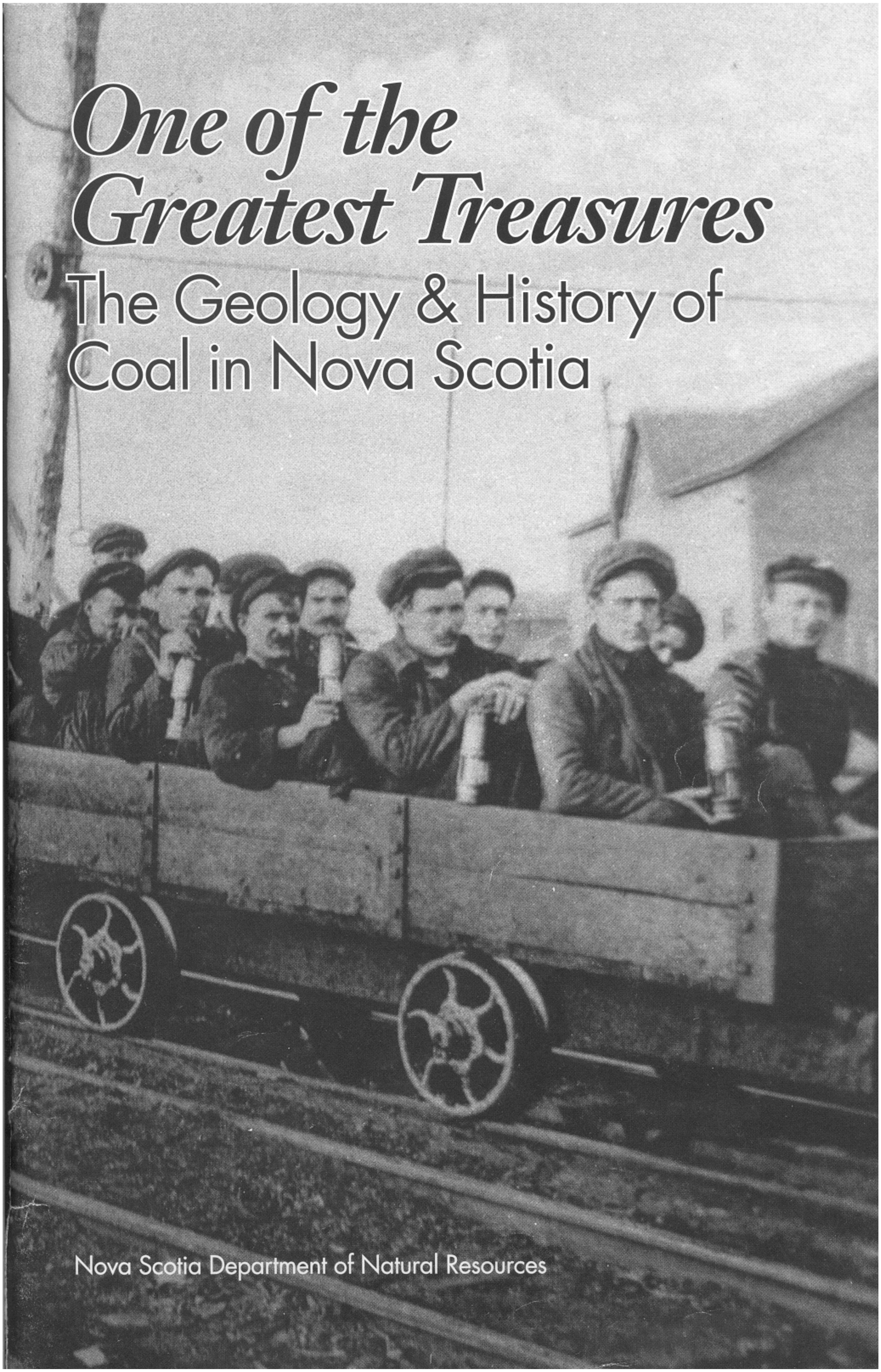
One of the Greatest Treasures

The Geology & History of Coal in Nova Scotia



Nova Scotia Department of Natural Resources

One of the Greatest Treasures

The Geology & History of Coal in Nova Scotia

Information Circular No. 25

J. H. Calder, K. S. Gillis, D. J. MacNeil, R. D. Naylor and N. Watkins Campbell

Nova Scotia Department of Natural Resources

Canadian Cataloguing in Publication Data

Main entry under title:
One of the greatest treasures

(Information circular ; 25)
Includes bibiographical references.
ISBN 0-88871-259-6
1. Coal – Nova Scotia.
2. Coal mines and mining – Nova Scotia.
I. Calder, J.H.
II. Nova Scotia Dept. of Natural Resources.
III. Title : the geology & history of coal in Nova Scotia.
IV. Series: Information circular
(Nova Scotia Dept. of Natural Resources) ; 25

TN806.C32N67053 1993 553.2'4'09716 C93-092602-1

Designed and produced by the Department of Supply and Services
Information and Communication Services.

Cover: Miners, safety lamps in hand, are seated on the rake that will carry them to work underground in the old Donkin Mine, Cape Breton, in 1918. (Owen Fitzgerald Collection)

Dedicated to the coal miners of Nova Scotia

Acknowledgements

The text of this book may not have been read If not for the creative design abilities of graphic designer Paul Chenard. The publication is enriched by the mining photographs of Owen Fitzgerald and wood block prints from Sir William Dawson's Acadian Geology. The writers thank all those who helped in the preparation of the book, including typist Jill Cumby; staff of NSDNR Cartographic Services, in particular, photographer Reg Morrison; our colleagues in the Coal Resources Section; Debra MacNabb, Museum of Industry; and staff of the Public Archives of Nova Scotia. JHC would like to thank Jim Nodwell of Springhill for the wisdom that every single miner's death was in itself a mining tragedy.

Contents

Coal at Two dollars a Ton

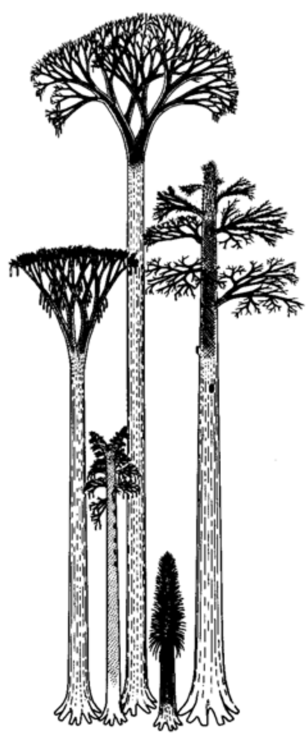
Afar in the Carboniferous time
I grew in Paleozoical slime,
A Lepidodendron with boughs on my stem
And Lepidostrobuses grew out of them.
My roots in the mud of the ages I spread
And up to the heavens I vaulted my head,
I throve in the heat of tropical sun,
And now I am coal at two dollars a ton.

Behold from my bed on the primitive shale
How quickly they raise me, the steed of the rail
Is mine, yea, mine are the ships of the sea
And shivering multitudes clamour for me.
As chariots borne through the sleet and the snow
Of winterbound cities in triumph I go,
In honour and dignity second to none,
For now I am coal at two dollars a ton.

Arthur Guiterman —1932

Arthur Guiterman—1932

Lepidodendron *(center and far right) and other trees of the Carboniferous coal swamps. (From DiMichele and DeMaris, 1987)*



Introduction

Glace Bay, Joggins, New Waterford, Port Hood, Springhill, Stellarton, and Westville--these are but a few of the towns and villages in Nova Scotia that share the heritage of coal. Coal helped to create many of our communities in Nova Scotia and coal will continue to be an important factor in their economic growth. The industry in Nova Scotia provides thousands of jobs and contributes several hundred millions of dollars to the provincial economy each year.

Coal is an important energy source in meeting Nova Scotia's demand for electricity. Approximately 70 per cent of the electricity generated in the province each year comes from our own coal resources. Power generation requires over two million tonnes of coal each year, while over one million tonnes of coal is shipped by sea to countries around the world and by rail to smaller industrial users in Canada.

Most energy experts agree that, largely because of trends in under-developed countries, by early in the next century coal will replace oil as the single most important source of all energy use on earth. It may interest you to know that Canada has more energy stored in its coal reserves than all Its conventional crude oil, natural gas, and oil sands combined. This holds true in Novo Scotia also where we have coal resources estimated to be greater than three billion tonnes. The amount of coal which can be mined from our resources in Nova Scotia will depend in large part on financial and environmental considerations and future advances in mining technology. But even if only one third of our coal is mineable, we may have enough reserves of coal in the ground now to last us about 250 years at the level of present-day use.

There are serious environmental issues surrounding the use of most energy sources and coal is no exception. Two areas of environmental concern in Nova Scotia associated with using coal are acid rain and global warming. The coal industry in Nova Scotia is committed to minimizing the effects on the environment of coal burning through clean air and water management and restoration of mined lands. The development of a new, world-class coal-burning technology for the power generating station at Point Aconi, which will reduce sulphur emissions by over 90 percent; is an example of this commitment. Explanation of the programs and technology under investigation and development in Nova Scotia to lessen the impact of coal use on the environment will be given in a series of brochures on coal production to be produced by the Department of Natural Resources.

Another important aspect of this valuable Nova Scotia resource is the potential for other uses for coal and related gases. Processes are under development that will make it possible to extract gases and liquids from coal. Potential markets for such fluids range from the transportation industry to the fertilizer industry. Further discussion of alternative uses for coal can be found in the brochures.

An important form of energy from coal may be available to us in Nova Scotia without us having to actually mine the coal. Coalbed methane is a clean-burning gas that can be extracted from coal seams, if geological conditions are favourable, by drilling holes or wells from above ground and capturing the gas. Many of our seams that are too deep or too thin to mine may prove to be very valuable to us as a source of methane. One of the most promising coal basins in Nova Scotia for methane extraction is the Cumberland Basin, the largest onshore basin in the province, with a possible coal resource of over one billion tonnes. More about this and other coal-bearing basins can be found under the description of our Nova Scotia coalfields in this publication.

This latest publication on coal in Nova Scotia discusses how this important energy resource was first formed---offering a glimpse into the ancient swamp and landscapes--and goes on to explain where coal is found in Nova Scotia and why. Also provided is some interesting historical background of the coal mining industry and how it helped shape the history and future of Nova Scotia and its people. The recollections of one of our miners brings a personal face to this history.

A subsequent series of brochures will discuss coal exploration methods, the mining of coal and its preparation far use, the development of new technologies for coal use and, importantly, environmental concerns and solutions regarding the use of Nova Scotia's primary energy resource.

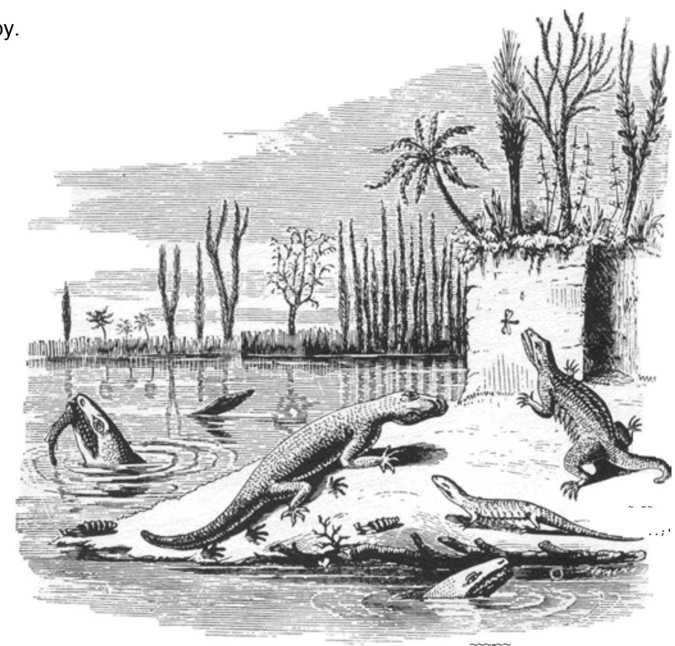
Fossil foliage of (left to right) Aledtopteris, Sphenophyllum, Lepidodendron, Asterophyllites (Calamites), Cordaites, Neuropteris, *and* Odontopteris, *from coalfields across Nova Scotia. (From Dawson's* Acadian Geology)

The Origin of Coal

"…*these beds carry our thoughts back to a period when the district was coveted by a strange and now extinct vegetation, and when its physical condition resembled that* of *the Great Dismal Swamp, the Everglades* or *the Delta* of *the Mississippi.*" J. W. Dawson (1855).

Imagine for a moment that we are able to embark on a trip back through time, before man appeared on the earth, before the age of dinosaurs:, to a time over 300 million years ago when lush rainforests and wetlands flourished between mountain ranges across much of what is now northern Nova Scotia and Cape Breton.

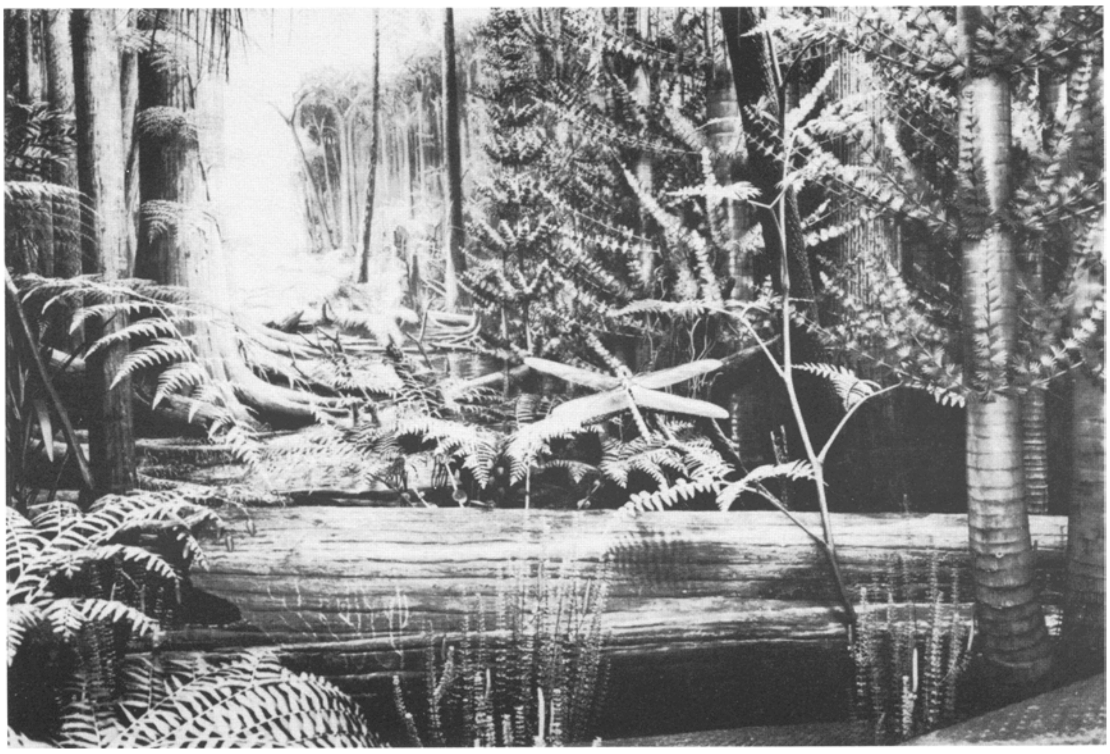
Shafts of misty sunlight filtering through the forest canopy illuminate a strange pageant of prehistoric life. Huge winged insects whir amidst the trees of the forest swamp, most of which are unlike any found on earth today. Most of the trees are unbranched until their very tops, their growth being dedicated to an upward thrust for sunlight at the forest canopy. Ornate geometric patterns adorn the trunks, some of which reach a metre in diameter. Climbing, vine-like plants entwine the large trees. Fronds arch gracefully from tree ferns, not unlike those found in tropical regions today. Bamboo-like *Calamites,* each stem mere inches apart, form dense thickets in the understory of the forest swamp.



"Reptiles of the Coal Period"--Baphetes, Dendrepeton, Hylonomus *and* Hylerpeton—*from Dawson's* Acadian Geology.

A large *Lepidodendron* tree, split asunder by lightning days before, smoulders in the dampness of the forest swamp, creating a break In the forest canopy. The sun, barely discernible through the low cloud, is directly overhead, betraying the tropical location of Nova Scotia 300 million years ago. The darkening skies and distant rumble of thunder announce that the forest will soon again see monsoon-like rains.

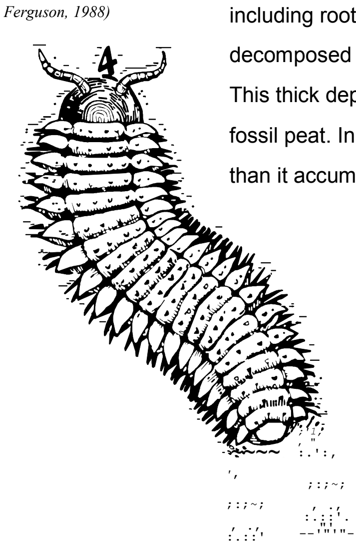
On the forest floor, an *Arthropleura,* giant ancestor of modern millipedes like the common sow-bug, slowly twists its two metre-long body through a calamite stand, searching for a particularly appealing plant. The dim light betrays the movements of a small lizard, *Hylonomus,* descending into a hollow upright tree trunk, temporarily eluding the larger predatory *Dendrepeton.* Some of the earliest reptiles to appear *on* the earth in the progression of animal life from water to land are believed to have evolved in the cradle of these ancient Nova Scotian swamps.



The damp, lush world of a Carboniferous peat swamp. (Courtesy Field Museum of Natural History, Chicago)

At the edge of the forest swamp, a shallow lake occupies the floodplain of a river meandering across the valley floor. In the water, small freshwater sharks feed. Shells at the lake's edge indicate an abundance of clam-like molluscs. Across a thin layer of mud left by receding flood-waters, an ancestor of the horse-shoe crab leaves a delicate trackway, crossing the imprint of rain-drops that spattered down earlier that day. Perhaps the trackways will become fossilized and will be found exposed along the shore of Nova Scotia some 300 million years later, offering us a glimpse into the events of this day in the ancient swamp.

The gigantic millipede Arthropleura *left behind fossil trackways wide enough to span this open book. (From Ferguson, 1988)*



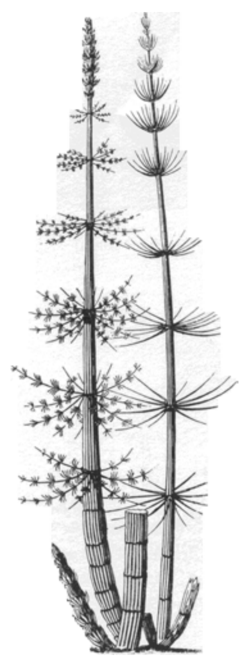
The rich plant growth in these ancient forests provided the organic material that would eventually form coal. Beneath the forest floor, plant material including roots, stems, tree trunks and leaves accumulated faster then it was decomposed by bacteria, fungi and creatures such as the *Arthropleura.* This thick deposit of plant material is referred to as peat. Coal, in essence, is fossil peat. In most environments, plant material decomposes more rapidly than it accumulates, but peat forms where the reverse is true. Specifically, the wetland must have a waterlogged surface with little access to oxygen. This protects the plant matter from decomposing organisms. In most areas where peat accumulates, the amount of rainfall exceeds the rate of evaporation year-round. Peat can still accumulate in regions that experience a yearly dry season if there is a source of groundwater to supplement rainfall so the peat stays water-logged.

Thick peats form beneath some everwet rainforests of the tropics, giving us a hint of the Carboniferous world that gave rise to our coal deposits. (Courtesy of J.C. Cobb)

Today, extensive peat deposits occur mainly in the northern hemisphere where cool temperatures hinder evaporation, and in tropical regions with very high rainfall. About 4 per cent of Nova Scotia's landscape is presently covered by peat deposits, some as thick as 8 m. However, the vegetation and settings of the peat-forming tropical rainforests are considered by geologists to be more like the ancient peat swamps and bogs of the Carboniferous Period

Even though peat had accumulated those millions of years ago, it needed still more special conditions to form the mineral we know as coal. Whether or not peat will form depends largely on the climate. The preservation and burial of the peat, however, depends 1argely on geological processes, the most important of which is the continual subsidence of the land. Broad areas of the earth's surface that slowly sink or subside over millions of years are termed basins, and it is here that we find beds of fossil peat, or coal.

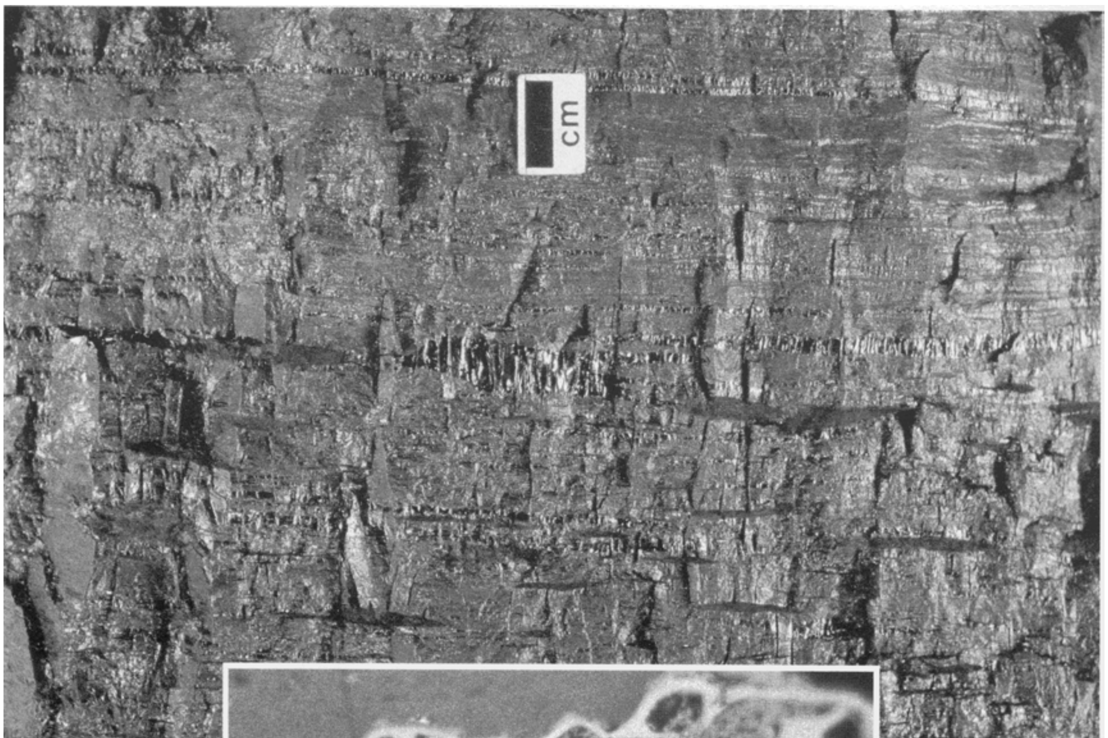
Calamites were a common wetland plant of the Carboniferous landscape (left: Calamites suckowi; *right:* Calamites cisti), *from Dawson's* Acadian Geology.

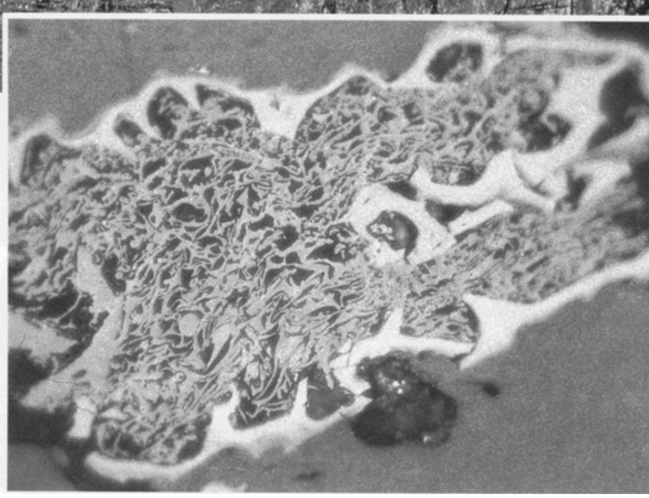


It is crucial that the buildup of peat beneath the forest must be able to keep pace with this gradual lowering of the earth's surface so that it is not overwhelmed by deposits of sediments or by rising water levels. Eventually, however, some change to the environment upsets the balance of land subsidence and peat accumulation, and both the last stand of vegetation and the deposit of peat may be buried. Scientists who study coal and modern peatlands are trying to learn just what changes occur to the environment to upset this balance. Many theories suggest that climate change over tens of thousands of years, caused by irregularities in the earth's orbit and axis, was partly responsible. Climate change can affect sea levels, drowning coastal swamps, and it can slow or halt the accumulation of peat.

Beneath the ever-deepening layers of sand, silt and mud, the peat is slowly transformed, physically and chemically, to coal. Initially, the weight of sand and mud compresses the peat, squeezing out much of the moisture. Eventually an intermediate stage between peat and coal, called lignite, is reached. As temperature and pressure both rise under the increasing thickness of sediment above, the lignite, or brown coal, is chemically changed into the black, lustrous rock that we know as coal. Usually, it has to be buried by 1,500 to 4,000 m of sediment. It is not so much the weight of sediment that causes the change to coal as it is the long-term exposure to the increase in temperature that accompanies deep burial. Coal geologists today make reference to the rank of the coal to describe the stage that a particular coal seam has reached in the transformation from peat through lignite to coal. Changes continue through the coal stage as well, from bituminous coal to anthracite. Most Nova Scotia coals are bituminous.

The history of a Carboniferous peat swamp, including fire and flood, is recorded in layers of coal.





Under the microscope, details of the ancient plants can be seen within the coal. These delicately preserved cell walls were probably charred by fire.

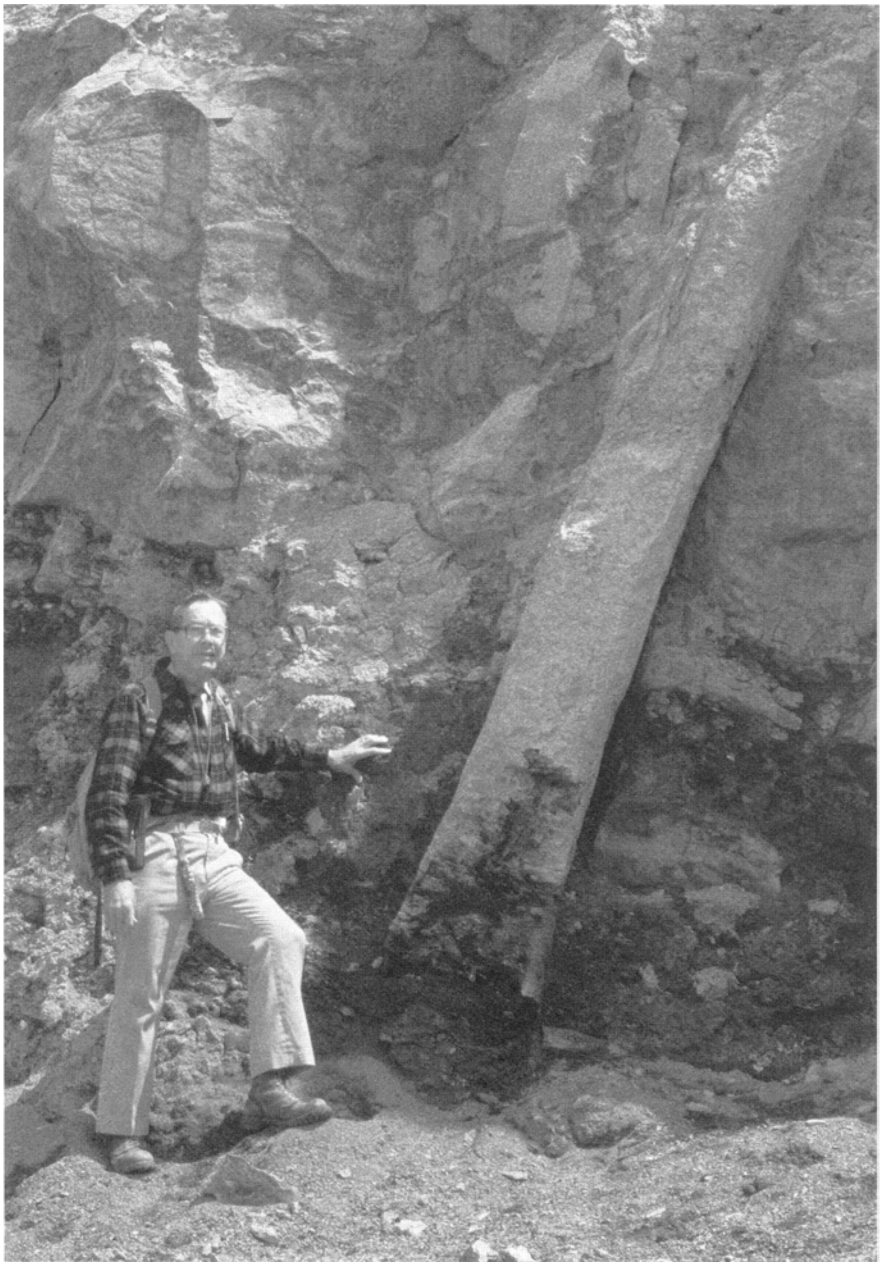
Looking at coal today, we can see evidence of the history of the forest swamp and the layers of plant material that accumulated long ago. The bark and wood of large trees form bright, almost glassy layers. Thin layers of sooty, soft material, called fusain by coal geologists, are actually fossil charcoal, evidence of fires in the primeval forest. Dull, heavy layers give clues to the presence of tiny grains of sediment washed into the ancient swamp by floodwaters. This inorganic matter is left behind as ash when coal is burned.

A thick layer, or seam, of coal tells us that the ancient forest swamp existed for a remarkable length of time. Peat accumulates beneath modern tropical rainforests of Southeast Asia at the rate of about 2 mm per year. Because peat is compressed as it is transformed to coal, it may take between 5 and 10 m of peat to form just 1 m of bituminous cool. A cool seam that is just one metre thick may represent 2,500 to 5,000 years of plant accumulation beneath the ancient forest swamps. The thickest cool seam in Nova Scotia is the Foord seam in the Pictou Coalfield, which in places reaches a thickness of 13.4 m representing 33,500 to 67,000 years of plant accumulati9n!'

Alethopteris, *the foliage of a seed fern, is shown here life-size. It was delicately preserved in roof rock of the Gardiner seam, Sydney Coalfield.*

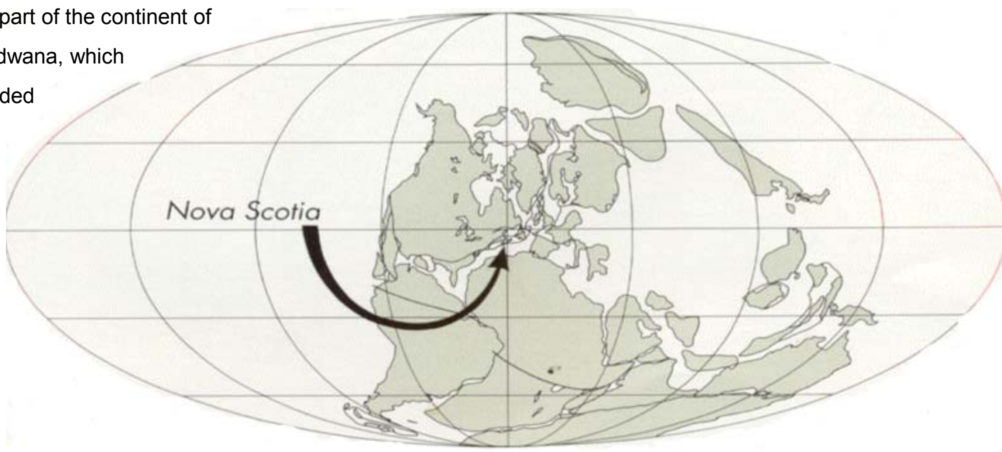
In the shales and sandstones overlying seams of cool, we see fossils of the plants that grew adjacent to the ancient peat swamps. In some cases, the trunks of extinct trees such as *Sigillaria, Lepidodendron,* and *Lepidophloios* still stand upright above the cool; beneath the seams large roots called *Stigmaria are* commonly encountered. The coastal cliffs of northern Nova Scotia offer the opportunity to see these fossils. The Joggins Fossil Cliffs, perhaps the most famous of these sites, has been declared a protected site by the Nova Scotia Museum.

Fossil trees can be seen in the coastal cliffs of Nova Scotia's coalfields. This one at Joggins is still standing in the position in which it grew.



The Coalfields of Nova Scotia

The coal resources of Nova Scotia lie in northern Nova Scotia and Cape Breton Island. Why is this so? The natural landscape of Nova Scotia, in essence, consists of a northern and a southern part separated by a boundary line running east-west from the Minas Basin to Chedabucto Bay. This line defines a major fault, a break in the earth along which two segments of the earth's crust have moved. Along this fau1t, which geologists have named the Cobequid-Chedabucto fault zone, landmasses that included northern and southern Nova Scotia collided long ago. Amazingly, northern Nova Scotia was once part of the ancient continent of Laurentia, while southern Nova Scotia was part of the continent of Gondwana, which included present day Africa.

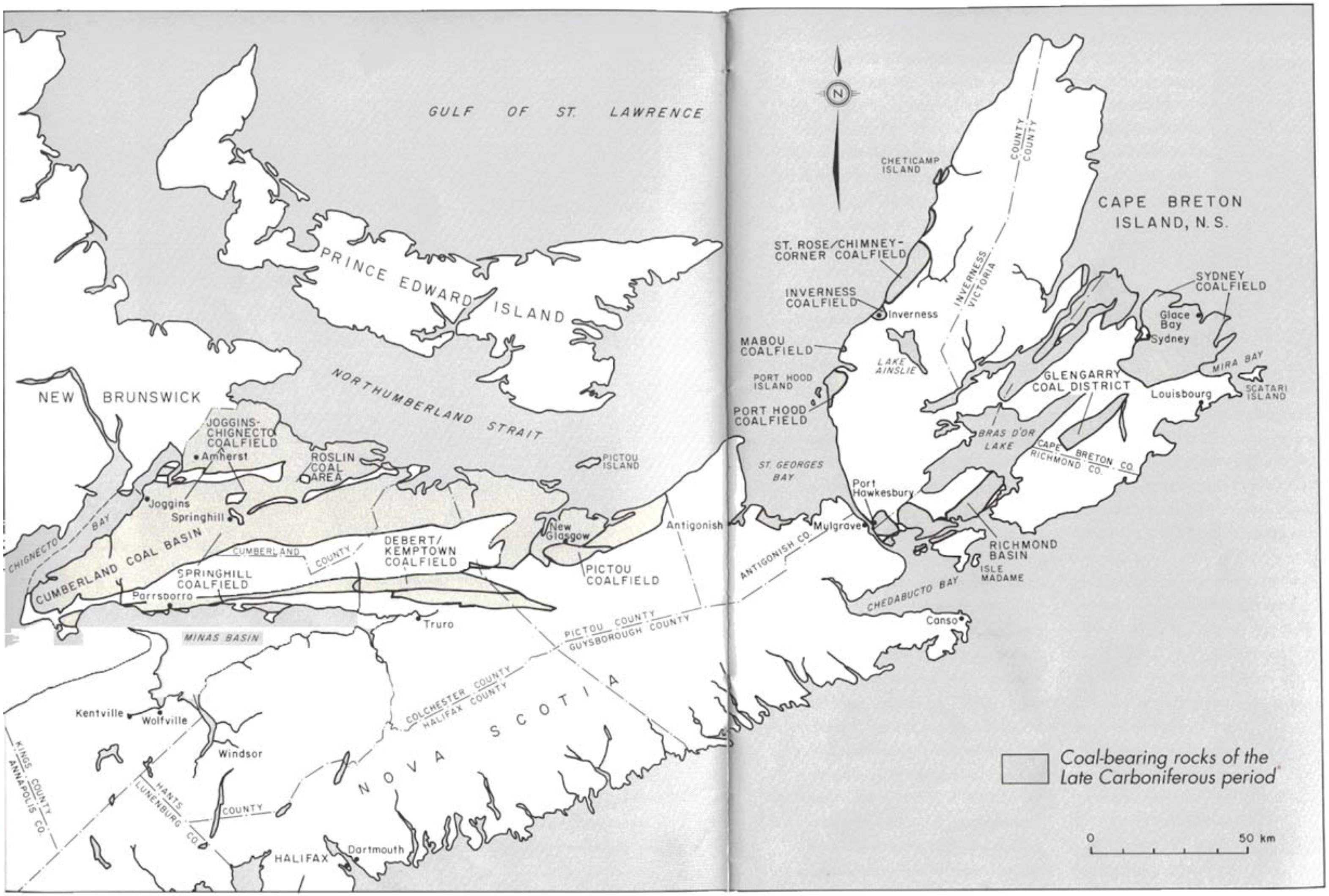


The Carboniferous World. Then, 300 million Years ago, Nova Scotia lay near the equator.

The collision of these two continents, which produced the Appalachian Mountains of eastern North America, began about 380 million years ago during the Devonian Period. The two land masses continued to move from time to time through the Carboniferous Period. Since then, these two very different parts of Nova Scotia have shared a similar history, but testimony to their different origins remains in the rock record.

Largely as a result of the joining of these two landmasses, numerous mountain ranges and valleys formed across northern Nova Scotia. Lowland areas, termed basins, formed as faults pulled apart the earth’s crust causing the area between the faults :to subside. These lowland basins were slowly infilled by sediments from adjacent mountains and from far-travelled rivers, some from the distant Appalachian Mountains. Eventually, during the Carboniferous Period, these lowland basins would become sites of luxuriant peat-forming forest swamps, fore-runners of Nova Scotia's cool deposits.

The coals of Nova Scotia are not all of the same age. A few Thin coals occur in the Late Devonian and Early Carboniferous rocks, termed the Horton Group, that represent some of the Earliest sediments to enter the basins of Northern Nova Scotia. Conditions for peat Accumulation virtually ceased about 330 million years ago during the Early Carboniferous as a sea developed throughout most of the basins. Nova Scotia's salt and gypsum deposits, the Windsor Group, formed as the sea waters evaporated. By the Late Carboniferous Period, the sea had retreated and the climate had become more humid as the continents drifted ever so slowly northward across the equator. The climate, the tropical position of the continents, and the landscape of Northern Nova Scotia combined to set the stage for the development of extensive peat (coal} deposits. The earliest coals to deve1op in this, the true Coal Age, were those of the Cumberland Basin (Joggins and Springhill coalfields), Port Hood, and St. Rose-Chimney Corner coalfields. Favourable sites for peat accumulation changed as geological forces shaped the basins, and the coals of the Debert-Kemptown coalfield and Stellarton Basin (Pictou Coalfield! were deposited later. Widespread peat-forming conditions developed near the end of the 'Late Carboniferous when the coals of the Sydney Basin and Gulf of St. Lawrence Basin (Mabou-lnverness coalfield) formed.

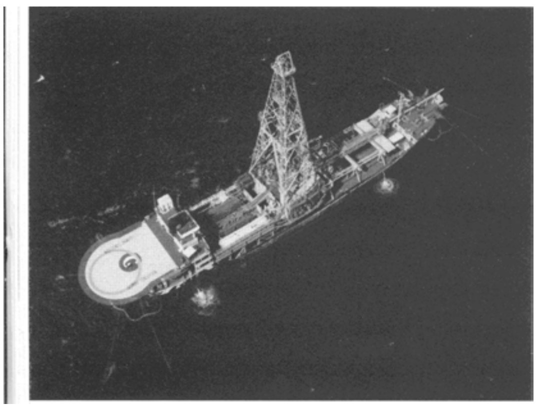


GULF OF ST. LAWRENCE
PRINCE EDWARD ISLAND
NORTHUMBERLAND STRAIT
NEW BRUNSWICK
JOGGINS-CHIGNECTO COALFIELD
Amherst
ROSLIN COAL AREA
Joggins
Springhill
CHIGNECTO BAY
CUMBERLAND COAL BASIN
SPRINGHILL COALFIELD
CUMBERLAND COUNTY
DEBERT/KEMPTOWN COALFIELD
Parrsboro
MINAS BASIN
Truro
PICTOU ISLAND
New Glasgow
PICTOU COALFIELD
Antigonish
ANTIGONISH CO.
PICTOU COUNTY
GUYSBOROUGH COUNTY
COLCHESTER COUNTY
HALIFAX COUNTY
NOVA SCOTIA
Kentville
Wolfville
Windsor
KINGS COUNTY
ANNAPOLIS CO.
HANTS COUNTY
LUNENBURG CO.
HALIFAX
Dartmouth
CHETICAMP ISLAND
COUNTY
COUNTY
CAPE BRETON ISLAND, N.S.
ST. ROSE/CHIMNEY-CORNER COALFIELD
INVERNESS COALFIELD
Inverness
INVERNESS
VICTORIA
MABOU COALFIELD
LAKE AINSLIE
PORT HOOD ISLAND
PORT HOOD COALFIELD
ST. GEORGES BAY
SYDNEY COALFIELD
Glace Bay
Sydney
MIRA BAY
SCATARI ISLAND
GLENGARRY COAL DISTRICT
Louisbourg
BRAS D'OR LAKE
CAPE BRETON CO.
RICHMOND CO.
Port Hawkesbury
Mulgrave
RICHMOND BASIN
ISLE MADAME
CHEDABUCTO BAY
Canso
Coal-bearing rocks of the Late Carboniferous period
0
50 km

Sydney Coalfield

The Sydney coalfield hosts the largest coal resource in eastern Canada and in recent decades has been the center of coal mining in Nova Scotia.

Drill ships were used in the 1970s to explore the coal seams of the Sydney coal field that lie deep below the ocean.



The Sydney coalfield is located on the north-east coast of Cape Breton Island, where coal-bearing rocks extend from Cape Dauphin 50 km east to Morien Bay .These coal-bearing rocks extend nearly to the south coast of Newfoundland, so more than 98 per cent of the coalfield lies beneath the ocean. Since so little of the coal-bearing rocks are accessible on land, the only direct information available on the submarine geology comes from the deep coal mines which . extend beneath the ocean and from some 20 offshore boreholes drilled from ships to explore for coal or petroleum. Geophysical surveys using seismic sound waves and other techniques have been used to define the geological structure of the extensive submarine basin.

A geologist searches for clues deep in a sub-sea mine of the Sydney coalfield that will help to predict the quality of coal and possible mining hazards in areas yet to be mined.

Coal seams as thick as 4.3 m occur in a sequence of sedimentary rocks that geologists term the Sydney Mines Formation of the upper Morien Group. Rocks of the Morien Group were laid down by major rivers flowing from the southwest, presumably to an ancient sea lying in the distant east near southern or western Europe. In early Westphalian time (named for the Westphal region of Germany), some 315 million years ago, movement on regional faults caused the Sydney Basin to begin to subside. As the land surface settled, rivers flowing from the south-west began depositing coarse, sandy sediments in the developing depression in the eastern part of the basin. Initially, land subsided rapidly, bringing coarse sediments into the basin, today represented by as much as 900 m of pebbly sandstones which geologists call the South Bar Formation.

As the basin filled, it subsided more slowly, regional slopes lowered, and the rivers took on a more gently flowing, meandering aspect. They deposited fine sand and muds on extensive, low-lying floodplains, possibly in a coastal setting. On these floodplains, when climatic conditions were favourable, vast basin-wide swamps developed in which vegetation accumulated to form thick deposits of peat, lakes formed locally on the surface of the peat. Eventually, peat accumulation ceased, and the swamps were overwhelmed by migrating rivers. After burial, these peat deposits were slowly transformed into the coal seams that are such a valuable resource today. The development of the coal-bearing Sydney Mines Formation resulted from a dozen or more cycles of deposition and burial of peat and deposition of sediment. Recent research suggests that these cycles may have boon controlled at least in part by the rise and fall of the ancient sea level. These sea level changes were probably influenced by glaciers forming or melting on the ancient continent of Gondwana.

Significant peat accumulation began in the Broughton--Port Morien area, forming the Tracy seam, the oldest mineable seam in the Morien Group. Later peatlands were more extensive resulting in seams (Harbour, Hub; Lloyd Cove, and Point Aconi) that are well developed across most of the basin. Throughout Morien time, about 300 million years ago, individual peatlands existed for the longest time in the easterly Donkin--Morien area and, therefore, these seams attained the greatest thickness.

The coal-bearing rocks of the Sydney coalfield are gently folded; faults bound the basin on the west and southwest. The northeast-trending folds probably represent draping and compaction of the sediments over the large faulted blocks of buried rocks that originally formed the basin floor . These "basement" rocks are underlying extensions of the present day Coxheath Hills and the Boisdale Hills.

The rook of the Sydney coals increases toward the east and as they dip deeper into the earth. They are classified generally as High Volatile A Bituminous but in the deep parts of the basin in the Donkin area, they reach a higher rank (Medium Volatile Bituminous), suited for use in steel making. Most of Nova Scotia's electricity is generated from the coal mined in the Sydney coalfield. Two underground mines, the Prince at Point Aconi and the Phalen mine near New Waterford, each bring between one million and two million tonnes of coal to the surface each year. Smaller reserves of coal that lie near the surface are mined by open-pit, such as the Pioneer mine near Reserve Mines. More on the mining and use of Nova Scotia coal is found in a series of brochures dealing with the mining and use of coal in Nova Scotia.

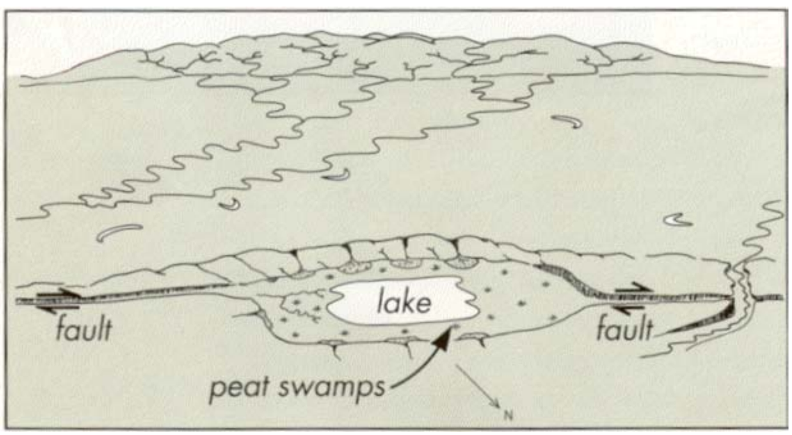
Pictou Coalfield (Stellarton Basin)

The Stellarton Basin or Pictou Coalfield, by which it is commonly known, is located in central northern Nova Scotia, underlying the towns of Stellarton, New Glasgow, Westville, and Thorburn. Although small in size, measuring only 18 km east-west and 6 km north-south, it contains the thickest coal seams in Eastern Canada. The Pictou coalfield is quite different from other coalfields in Nova Scotia because of the very thick coal seams and numerous oil shales, which were formed in a lake basin.

The Foord Seam, at 13.4 m, is the thickest coal seam in Nova Scotia.

The basin is bounded to the north and to the south by two major faults. When these two faults were active, approximately 310 million years ago, they pulled apart the earth's crust, forming a topographic low, or basin, as the land area between them subsided, or settled. Not surprisingly, the Stellarton Basin is an example of what geologists term a pull-apart basin. The rate at which the land surface between the two faults subsided influenced the nature of the basin f1oor, and in particular, the peat or coal-forming wetlands.

When the land subsided rapidly, the basin floor remained significantly below the: level of the regional water table and a deep lake covered much of the basin. When the land subsided more slowly, the basin floor stayed closer to the elevation of the regional water table and a shallow lake formed. Surface waters carrying sediment drained from highland areas Into the Stellarton Basin. The supply of sediment to the basin was often enough to infill a shallow lake, but insufficient to infill a deep lake. If a shallow lake became infilled, plants colonized the basin floor and a basin-wide swamp often formed. Swamps also periodically formed along the margins of deeper lakes. Under special conditions (see Origin of Coal) swamps became peat-forming and the initial process of coal formation began. A peat swamp existed until the basin floor subsided and fell below the regional water table. Repeated cycles of lake formation and infilling followed by the development and eventual drowning of a swamp continued for at least two million to five million years. Today the lake and swamp deposits which accumulated during this period form a 2 600 m thick sequence of sedimentary rocks and coals known as the Stellarton Formation.



The thick coals of the Stellarton Basin formed in a small lake basin that was being pulled apart by two faults moving in opposite directions.

Historically, the coalfield has been described in terms of three mining districts: Westville, Albion Mines (now called Stellarton), and Thorburn. The largest number of coal seams occur in the Westville and Stellarton areas. One of these, the Foord seam, at 13.4 m is the thickest coal seam of Carboniferous age in North America. The thinner seams of the Thorburn area are associated with numerous oil shale beds. Oil shales are essentially dull coals that formed from small plant fragments that sett1ed out on the ancient lake bottom. The town of Stellarton owes its name to one of these oil shales, mined in the 1850s and called "stellarite" because of the "stars of fire" given off by its sparky flame.

The coals of the Stellarton Basin are of a rank and quality suitable for generating electricity .A notable exception is the Acadia seam of the Westville area, which, deep in the basin, is of high enough rank to be used in steel making. The seams of the Stellarton district, including the Foord, have the lowest sulphur content of any Nova Scotia coals.

Mining has taken place in this basin since the beginning of the nineteenth century and, for its size, it has been one of the most productive coal basins in Canada. Approximately 55 million tonnes of coal have been mined from the Pictou Coalfield to date (read the chapter on history which follows for further details). Even so, significant potential for both small- and large-scale mining operations still exists in the Stellarton Basin because of the great thickness and number of coal seams.

Coalfields of the Cumberland Basin: Springhill and Joggins

The dramatic exposures of coal-bearing rocks and fossils of the Joggins cliffs are world-famous.

The Cumberland Basin, which underlies most of Cumberland County, is the largest onshore coal basin in Nova Scotia (the larger Sydney Basin extends offshore). The Cobequid highlands border the basin on the south, and the Caledonia highlands of New Brunswick form a western margin. The coastal cliffs extending from Joggins south to Spicers Cove, a distance of 50 km, offer a splendid view of the coal-bearing rocks, which have been named the Cumberland Group. These breathtaking cliffs so moved Sir Charles Lyell, one of the fathers of the science of geology, that in 1871 he described them as *"the finest example in the world'* of Carboniferous rocks.

The Joggins fossil cliffs, as they are commonly known, have yielded many important scientific discoveries. Among these was the discovery in 1852 by Sir William Dawson, a native son of Pictou, and Lyell, an Englishman, of reptiles and amphibians entombed in upright, fossil tree trunks. These reptiles have long been considered the first to have evolved on earth. The coal-bearing rocks of the Cumberland Group totalling 4 000 m in thickness, took approximately four million years to accumulate. To a geologist, this actually represents a very short time for such a great thickness of sedimentary rocks to have been laid down.

Although the Joggins coalfield was the site of mining since the early 1700s when Acadian settlers sought fuel for their forges, the coal seams of Springhill discovered a century later, have been the more sought-after. The coals of Joggins, which extend inland as far as Styles Brook (30 km), rarely exceed 1 m in thickness and have a greater sulphur and ash content than the coals at Springhill. Nonetheless, no fewer than 83 mines operated at various times from Joggins through River Hebert and Maccan to Styles Brook. The major seams that were mined are named the Fundy, Forty Brine, Jubilee, Queen, and Joggins.

In the mid-1800s, geologists discovered skeletons of the earliest known reptiles inside the trunks of fossil trees at Joggins. (From Dawson's Acadian Geology)

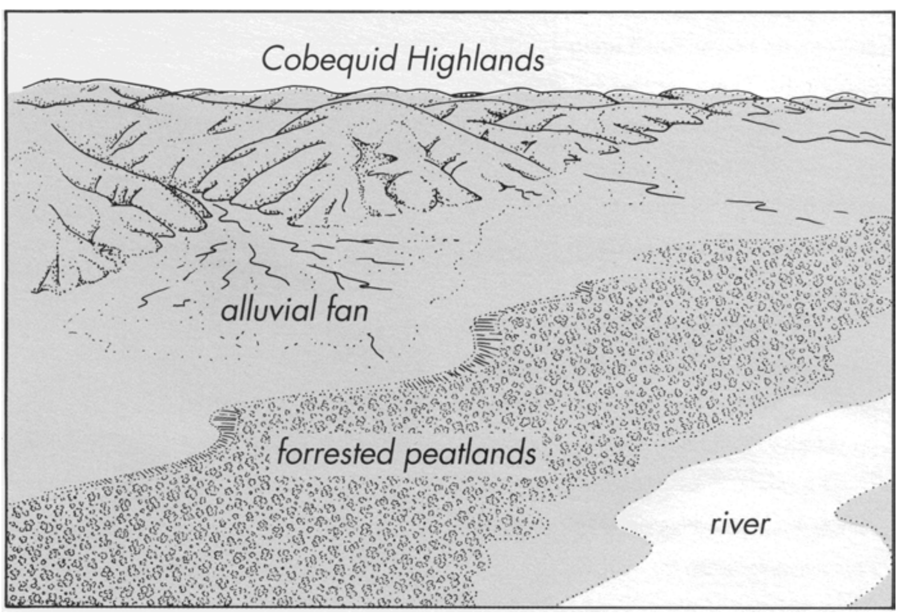
The more than 60 seams of Springhill vary in thickness from a mere 5 cm to as great as 4.3 m. Five of these, the No.1, No.2, No.3, No, 6, and No.7 seams were mined extensively underground. Two others, the Rodney and McCarthy seams, were mined on a smaller scale, the Rodney from an open-pit mine.

Cool seams occur elsewhere in the Cumberland Basin as welt, including Roslin and Salt Springs. A cool seam 2.8 m thick was reportedly intersected in an borehole drilled in 1903 near Newville Lake. Recent seismic surveys and the study of fossil plant spores in the coal-bearing rocks have shown that conditions favouring peat (coal) formation began at Joggins, with the location favouring peatlands slowly migrating southward toward Springhill as the basin filled. The Joggins seam at Joggins and the No. 6 seam at Springhill are thought to have formed at about the same time.

The coals of Springhill represent the fossil peat that accumulated beneath forest wetlands. These peat-forming wetlands occupied a narrow belt 4 to 9 km wide at the foot of gravelly deposits (alluvial fans) left by mountain streams that issued from the northern side of the Cobequid Highlands. The Cobequid Highlands today, after millions of years of erosion, are mere shadows of the mountains that stood in Carboniferous times.

The forest swamps were bordered on their opposite, northern, side by river systems that flowed through the basin . Recent research has shown why this ancient landscape, now buried largely beneath the Town of Springhill, supported the peat-forming forest swamps. Especially important was groundwater that seeped from the gravelly alluvial fans fed by mountain run-off. The nutrient-rich groundwater encouraged vigourous plant growth while providing the waterlogged conditions necessary for peat formation.

A geologist's reconstruction of the landscape of the Springhill coalfield some 310 million years ago.



Quite possibly, the availability of this groundwater allowed individual peat-forming ecosystems to exist for longer periods at Springhill than at Joggins, which were more distant from the highlands. The result is that the coals at Springhill are much thicker than those of Joggins.

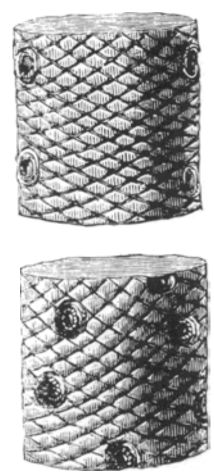
After thousands of years, however, peat accumulation eventually slowed because of changes in the environment, especially to the climate, and the wetland became overwhelmed by sediment deposited by neighbouring rivers. These river systems, free to meander across the area once occupied by the forest wetlands, slowly built up deposits of sand that would eventually turn to sandstone. Inevitably, the river would change course, abandoning the area. On the abandoned river plain, in the wetness provided by the alluvial fans, the forest wetland would once again grow and accumulate peat, eventually forming yet another coal seam, and continuing the cycle of coal formation.

The inevitable occurrence of the resulting thick sandstones overlying the coals of Springhill was well known to coal miners. The presence of these sandstone bodies, which resisted collapse, and the pressure arising from the great depth to which the coal seams were pursued underground both contributed to sudden, explosive bursts of coal as it was being mined. These infamous underground rock bursts are known locally as "bumps," which are like underground earthquakes.

St. Rose-Chimney Corner Coalfield

The St. Rose--chimney Comer coalfield is located 15 km north of Inverness. Coal occurs at 1wo localities, St. Rose and Chimney Corner, separated by 3 km of faulted ground in which no coal seams are known to occur. After examining the coals and fossil plant spores under the microscope, geologists have concluded that peat and sediment of the two areas were deposited in the same basin. The area known as the St. Rose coalfield is a small (2 km x 1.2 km) remnant of the original basin. The coal seams are cut off to the west by the St. Rose fault. Early Carboniferous gypsum deposits occur on the west side of the fault. An abundance of fossil shells in the strata capping the coals at St. Rose attest to the existence of lakes in the ancient peat-forming landscape.

Five cool seams are present in the St. Rose-Chimney Corner coalfield and the same seams have been identified at each locality. Two seams, the No. 2 and No. 5, have been economically important in the past, the No. 5 seam at St. Rose having been mined underground at the Evans Mine until 1992. The coals, which are relatively high in ash and sulphur, have been used for power generation and home heating. To the north of St. Rose, the coalfield at Chimney Comer occupies a narrow 2 km strip of coastline. Except for this small land area, the coalfield at Chimney Corner lies beneath the ocean. The cool deposits of the Chimney Comer area are not considered economically viable because the seams are thin and difficult to mine.



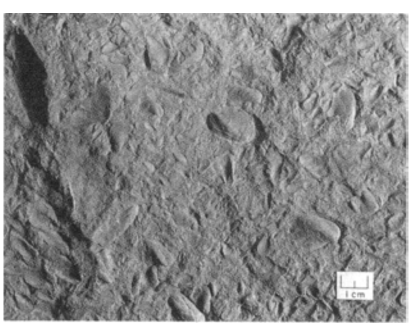
Bark of Lepidophloios, *one of the coal-forming trees (From Dawson's* Acadian Geology).

Mabou-Inverness Coalfield

The coalfields at Mabou and Inverness are located on the west coast of Cape Breton Island. The coalfields lie approximately 10 km apart. Coal-bearing rocks exposed in coastal cliffs represent the edge of a large coal basin that now underlies a large portion of the Gulf of St. Lawrence. This huge, largely submarine area is referred to as the Gulf of St. Lawrence Coal Basin.

The upturned coal seams, sandstones and shales of the Mabou coalfield bear witness to the geological upheavals that have occurred here since these rocks were deposited.

As in many other coal basins of Nova Scotia, the ancient landscape in which the peatlands of Mabou formed was one dominated by major rivers and lakes. The coastal cliffs at Mabou are among the most picturesque exposures of coal-bearing strata in Nova Scotia. The near-vertical position of the seams near Coal Mine Point bear witness to geologic upheavals that occurred after the peat deposits had turned to coal. Jagged lenses of coal visible in sandstones at Finlay Point represent mats of peat torn by ancient rivers from the margins of the primeval swamps.



Mussel-Iike fossils ofNaiadites *and* Anthraconauta *are ftund in beds lying above or be/ow the coal seams of Joggins, St. Rose, Port Hood, Mabou and Sydney.*

At Mabou, eight coal seams are found. The seams outcrop at two small land areas, Mabou Mines and Finlay Point. Three coal seams, the 7 Foot, 8 Foot, and 15 Foot were mined, with most of the work taking place on the 7 Foot and 8 Foot seams. Minor coal extractions, by way of prospect shafts, took place on the 15 Foot seam. The bulk of coal resources at Mabou today are confined to the offshore extensions of the 15 Foot and 7 Foot seams, which were discovered in two offshore drillholes. This exploration was conducted in 1978 from the drill ship *Glomar Grand Banks.*

At Inverness, coal-bearing rocks occupy a land area of approximately 9 square km. Four coal seams are present, ranging from 0.9 m to 4 m thick. The angle at which the seams dip increases sharply to the north as they approach the Inverness fault. Resources on the 13 Foot, 7 Foot, and 4 Foot seams have been depleted as far as the Inverness Fault. To the north of this fault, the resource potential, based on seismic interpretation, is more promising.

Studies utilizing fossil spores, offshore drilling, and seismic surveys indicate that the principal seams in the Inverness coalfield, namely the 13 Foot and 7 Foot seams, are also present offshore in the IVIabou coalfield .Faults between the two areas onshore obscure the relationship between the Mabou and Inverness coalfields.

Because of the relatively high ash and high sulphur content of the Mabou and Inverness coals, they have been deemed more suitable for power generation than for steel-making. The last coal mining operation closed In 1966.

Port Hood Coalfield

The Port Hood coalfield is situated on the west coast of Cape Breton Island. Little of the coal-bearing rocks is exposed on land . They dip westerly beneath the Gulf of St. Lawrence, so that the coalfield is essentially under water. Information on the geology and structure of this coalfield has come from underground mine workings, drillhole information, and geophysical surveys conducted from ships.

The coal seams in the Port Hood coalfield were formed in a wetland environment dominated by lakes and rivers, not unlike that at Joggins. A river meandered over the plain depositing layers of sand and mud. Swampy areas clung to its banks, with open lakes on the floodplain. In the swampy areas, plant life flourished. With time, the sand and mud formed the present day sandstones and mudstones or shales. In the swampy areas associated with lakes, peat and plant debris accumulated and were preserved and buried to become the coal seams and black mudstones of today. The coal-bearing rocks of Port Hood have yielded the skeleton of one of the oldest known reptiles, rivalling those found at Joggjns.

Sediments that accumulated in the subsiding basin were compacted to form a sequence of sedimentary rock layers 1300 m thick, but only the upper 400 m of rock contain coal seams. Four relatively thick coal seams were developed in the Port Hood coalfield, but only one, called the 6 Foot Seam, reached a mineable thickness. Seismic surveys conducted from ships indicate that the 6 Foot Seam dips down to the west from the coast under Port Hood and Henry Islands. The coal is relatively high in ash and sulphur. The last operating mine at Port Hood closed in 1966.

Debert-Kemptown Coalfield

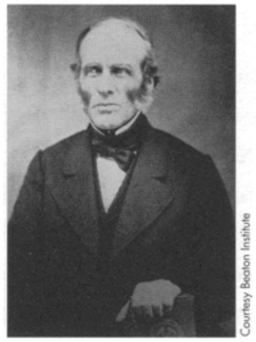
The Debert--Kemptown Coalfield lies at the southern foot of the Cobequid highlands in an area of 230 square kilometres, elongated in an eastwest direction, approximately 10 kms north of Truro. The dislocation of coal-bearing rocks along faults makes it very difficult for geologists to reconstruct the geological history of this coalfield. Essentially, the geologist must first re-assemble a three-dimensional "rock puzzle" to determine the original arrangement of the rocks and coals within the coalfield.

Despite the complex geology, we know from the study of fossil plant spores that the age of the coals is similar to those found in the Cumberland and Stellarton basins. The peatlands that existed here in Carboniferous time flourished on the opposite side of the ancestral Cobequid mountains from the forested wetlands of Springhill, and may have formed in somewhat similar environments. The Debert--Kernptown coals are generally less than 1 m thick, but some near Debert are thicker .Small-scale and short-1ived coal mines operated in the coalfield between 1903 and 1936, particularly in the Kemptown area, but were largely unsuccessful because of the many faults encountered in the mines. The rank of the coals increases from west to east near Kernptown, where it reaches Semi-anthracite; the highest rank of any coals in Nova Scotia. This means that the transformation from peat to coal has proceeded here almost as far as possible. The coals of Kemptown may have been exposed to higher than normal temperatures because of their position near the major fault system along which the ancient landmasses of Gondwana and Laurentia joined many millions of years ago.

Pioneers of Nova Scotia Coal Geology

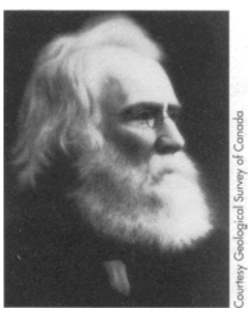
Abraham Gesner (1797-1864)

Gesner, a brillant native Nova Scotian, was a medical doctor and a self-taught geologist. In 1836 he wrote one of the first geological accounts of Nova Scotia. From his medical practice in Parrsboro he journeyed about northern Nova Scotia. His writings would draw Lyell, Logan, and Dawson to the fossil cliffs of Joggins. Gesner's fortunes waxed and waned .After losing a famous court battle and most of his savings over the albertite deposits of New Brunswick, he later became wealthy with his invention of a process to manufacture kerosene from coal.



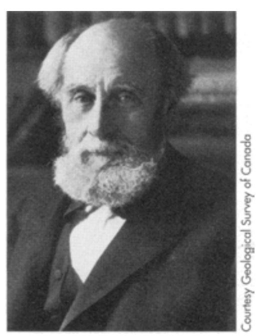
Richard Brown (1805-1882)

Brown was agent and manager of the General Mining Association in Cape Breton from 1827 to 1864. A mining engineer and geologist, he guided early development of the coal mining industry in Cape Breton, including the first mine to exploit the submarine coal—the Princess Colliery. He presented many papers on the geology and paleontology of the Sydney Coalfield to the noted Geological Society of London. His book *History of the Coal* Trade *of the Island of* Cape *Breton* {1871) is still a reference for information on the early days of the coal industry in Cape Breton.



Sir William E. Logan (1798-1875)

In 1840, Logan proposed the theory, now largely taken for granted, that coal was formed in place by the accumulation of the plants whose fossil remains are found in the coal and surrounding rocks. As founder and first director of the Geological Survey of Canada, Logan in 1842 undertook its first project, namely the detailed, bed-by-bed description of the Joggins fossil cliffs. His account still stands as the reference description for this world famous site.



Sir J. William Dawson (1820-1899)

A graduate of Pictou Academy, Nova Scotia, Dawson made an enormous. contribution to the science of geology. His *Acadian Geology,* first published in 1855, is a treasured work. A keen observer, Dawson possessed an uncanny ability to comprehend the prehistoric world. Among his many fossil discoveries, one of the most famous was that of reptile skeletons entombed in fossil tree trunks of Joggins. These reptiles, reported jointly with Sir Charles Lyell in 1852, have long .been considered the first to have evolved on earth. Dawson was principal of McGill University from 1855 to 1892.

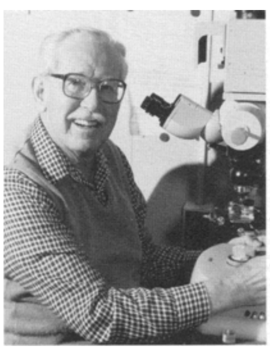
Hugh Fletcher (1848-1909)

Fletcher, a geologjst of the Geological Survey of Canada, undertook extensive field work in the province's coal measures from 1875 to his death at Lower Cove, Joggins, of pneumonia, which he contracted in the field. Fletcher's geological maps represent, in most cases, the first accurate delineation of many of the province's coalfields and stand today as examples of excellence infield geology.

Courtesy Geological Survey of Canada

Walter A. Bell (1889-1969)

Bell, largely through his expertise in paleontology and stratigraphy, formally defined most of the rock units of Carboniferous age in Nova Scotia. His descriptions of the relationships of the Carboniferous rocks within and between basins of northern Nova Scotia and Cape Breton serves as the foundation for geological studies in Nova Scotia's coal basins. His career with the Geological Survey of Canada spanned six decades, from 1911 to the 1960s.



Reg Morrison photograph

Peter A. Hacquebard (b.1918)

Dr. Hacquebard is know; by coal geologists worldwide as a pioneer in the microscopic study of coal, and in the use of coal microscopy and fossil plant spores to reconstruct the ancient environments of coal formation. Locally, Hacquebard's practical skills are well remembered by many in the coal mining industry. He has conducted research and field studies in most of Novo Scotia's coal basins throughout his long, distinguished career with the Geological Survey of Canada.

A Brief History of Coal Mining in Nova Scotia

"In the bottom of *a small brook, running through a wild forest* of *beech and maple, a poor farmer has been digging coal, one* of *the greatest treasures* of *the earth."* The first account of coal at Springhill by Abraham Gesner in 1836.

The mining of cool has been a major factor in the industrial and social development of Nova Scotia for three hundred years. The famous French explorer, colonizer and Governor of Acadia, Nicholas Denys, declared in a book published in Paris in 1672 that "there is a mountain of very good coal four leagues up the river" (Baie des Espanols or Sydney Harbour). Several years later, he was granted the right to levy a duty of 20 sous per ton on coal extracted from Cape Breton. This implies that by the mid to late seventeenth century, the coal resources of the island were already recognized and probably exploited, at least by passing mariners.

Frost, in an undated manuscript, stated that coal was first mined in the Sydney coalfield in 1685 by French military authorities from "crop openings."

The first commercial coal mine in Canada was opened at Cow Bay (Port Morien) in 1720. It was developed to supply the fortress at Louisbourg and periodically supplied exports to the New England colonies. The first officially recorded export of minerals from Canada occurred in 1724 when a shipment of coal was exported from Cape Breton to Boston. About the same time, French Acadians began extracting coal from the famous fossil cliffs at Joggins in Cumberland County.

Miners and foremen at No. 3 Colliery, Passcbendaele, Glace Bay, at the turn of the century. The men worked by the light of candies, affixed to their hats. (Courtesy Beaton Institute)

After the Seven Years' War brought about the final fall of New France, several groups, one including General Howe, vied for the right to open coal mines to supply garrisons and colonies in North America which until then had largely depended on imports of British coal. The Home Government neglected to take advantage of the cool resources, however, reserving them for use of the military authorities and a few minor, generally unsuccessful leaseholders. Richard Brown, pioneer mine engineer, commented in 1869 that "...The coal mines of Cape Breton were at this period entirely in the hands of smugglers and unauthorized persons."

In 1785, Governor DesBarres of the Colony of Cape Breton opened a mine on the Sydney Main or Harbour Seam at Sydney Mines which set off the virtually unbroken sequence of coal development in the Sydney coalfield. Though small in scale for the next half-century, it supported the growing towns around Sydney Harbour, as well as exporting to Halifax and Newfoundland.

In Pictou County, coal was first reported on the East River in 1798 by Reverend James McGregor. Eleven years later, the first license to mine coal was granted to John MacKay and by 1813 coal was being shipped to Halifax. The earliest workings in the Pictou coalfield were known as the Store and Bye pits. These pits were accessed by a series of shafts on the Foord Seam and coal was hoisted by horse gins and sold by children.

In 1825, all coal rights in Nova Scotia that had not been previously granted were given by the British Crown to the Duke of York, who immediately granted them to a firm of London jewellers to pay off his substantial debts. The 1ewellery firm, soon after, transferred the leases to a company called the General Mining Association (GMA) which held a virtual monopoly on the province's coal resources from 1826 to 1857.

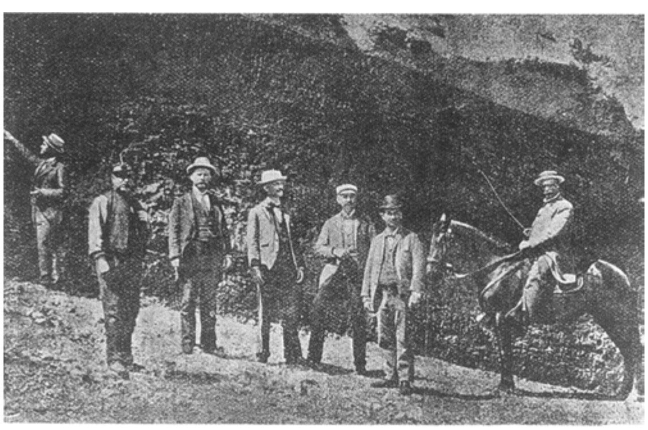
In 1857 the GMA, which introduced professional management and technological advances to the coalfields, surrendered much of its monopoly to the Crown. It retained only limited areas in Cape Breton, Pictou, and Cumberland counties. Since that time the provincial government has owned the coal resources of Nova Scotia. With this relinquishment, several new companies became lease holders, thus accelerating the pace of coal development through the nineteenth century in Cumberland, Colchester , and Pictou counties.

Miners of the Caledonia Colliery at Glace Bay, ca 1895. Note the kettle lamps on the soft caps. Seated, *l-r: Tim Tutt, Fred Wadden, Bill MacKenzie;* Standing, *l-r: Allie MacKenzie* (*9 years old), Jim Wadden, Peter Fobes, Tim Wadden. (Courtesy Beaton Institute)*

The Caledonia Colliery at Glace Bay operated from 1864 to 1892.

On Cape Breton Island, this development opened the coal-rich Glace Bay district to new operators. By 1870, some 20 collieries were producing, and firms such as the Sydney and Louisbourg Coal Company, the International Coal Company, and the Caledonia Coal Mining Company were established. The formation of the Dominion Steel and Coal Company (Dosco) in 1893 brought about the consolidation of all the previous operations in the Glace Bay and New Waterford districts. Meanwhile, the GMA continued to operate at Sydney Mines unti11900, when it was succeeded by the Nova Scotia Steel and Coal Company. As suggested by these new company names, the abundant local metallurgical coal and the proximity of Sydney Harbour to the iron ore deposits of Bell Island, Newfoundland, were the basis for construction of new steel plants at Sydney and Sydney Mines around the turn of the century .Peak production of coal was reached in the early 1940s, but the post-war period brought a steady decline; by 1960 only half of 'the original mines were still producing. Roughly 100 mines have been opened in the Sydney Coalfield, more than in any other field in Nova Scotia with the possible exception of the Cumberland Basin coalfields (Springhill and Joggins—Chignecto). The amount of coal that has been mine from the Sydney coalfield, however, eclipses all other coalfields in Nova Scotia combined.

A group of nineteenth-century entrepreneurs posing before a seam of coal at Broad Cove, Inverness County.



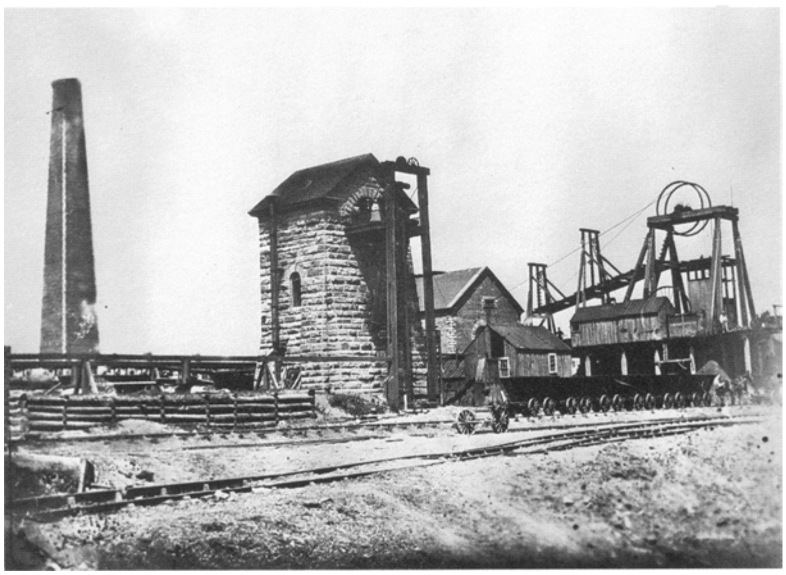
On the west coast of Cape Breton, the Cape Breton Coal Mining Company commenced mining at Port Hood in 1865. Mining began the same year at Inverness, and at Chimney Corner in 1 867. During the)ate nineteenth century, mining was sporadic in these areas. At nearby Broad Cove, the Broad Cove Coal Company was engaged in small-scale mining During this time.

Various attempts were made to develop mines in the geologically complex Mabou coal district during the late 18OOs and early 1900s by companies such as Port Hood Collieries Limited and the Eastern Trust Company. In 1961, the Scotian Coal Company Limited once again attempted to develop a mine at Mabou but abandoned this project in 1964.

During the early twentieth century, Port Hood Collieries Limited and Inverness Railway and Coal Company operated at Port Hood and Inverness. In 1947, the St. Rose mine began operation, and continued to operate under the direction of Evans Coal Mines Ltd. until flooding forced its closure in 1992.

In relation to its size, the Pictou coalfield is the most extensively mined area of the province. The original Acadia Coal Company was formed in 1864; however, the GMA.. continued operations until it sold its rights to the Halifax Coal Company in 1872. Several other companies were mining in the Pictou coalfield during this period, including the Intercolonial Coal Company and the Montreal and Pictou Company. The Acadia, Halifax, and Vale companies merged in 1886 to form a new Acadia Coal Company. Throughout the rest of the nineteenth century and on into the early twentieth century, the Acadia Coal Company was the major mining concern, although many others worked seams in various parts of the county.

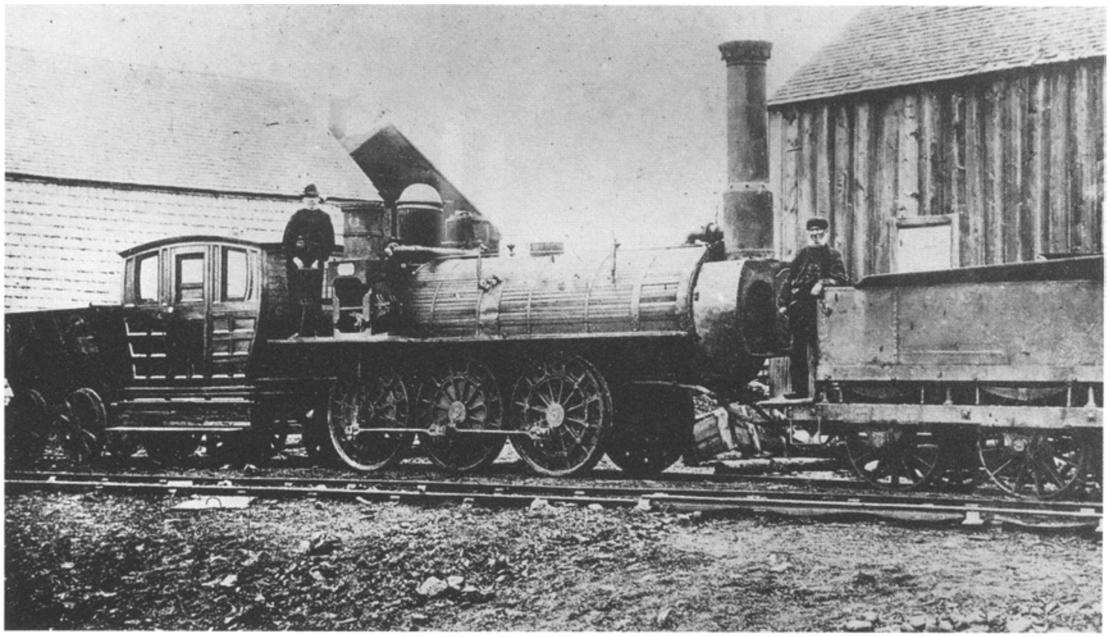
Henry Poole, a native Pictonian responsible for coal exploration for the Acadia Coal Company, graphically described in 1904 the risks involved in working in these early mines: "*The sinkers had gone to bank, and but one man remained below to fire a shot. The cotton was lit, and at the signal the gin horse sprang* away, *but the slack* of *the rope caught and the bowk with the man in it remained suspended over the shot. Instantly realizing his position the miner threw his bonnet and with true aim knocked* out *the snuff from the priming while the men on top waited for the blast in dread of the results."*



The Foord Pit, Stellarton (Albion Mines), opened by the GMA in 1867 and closed by explosion and fire in 1880. The stone Cornish pump house stands at the Museum of lndustry near its original location.

The Intercolonial Coal Company continued operation of the Drummond colliery at Westville well past the colonial era from which its name is derived, until purchased by Drummond Coal Company in 1961. (The mine, purchased by Pioneer Coal Co. in 1983, closed in 1984 due to an underground fire and declining reserves of coal.) The brick buildings of the Drummond, now demolished, were a testament to the grandeur and self sufficiency of the industry early in this century, when everything from side-tip

the province. It was the General Mining Association which in 1839 used the 17-ton steam locomotive *Samson* on the first railway in Nova Scotia. The *Samson* hauled coal between Albion Mines (now the town of Stellarton) and the

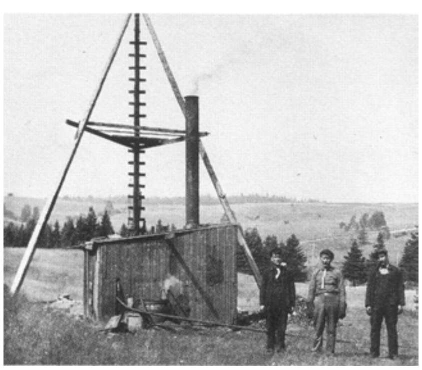


The early steam locomotive Samson *in its working days at Albion Mines, Pictou County. (Courtesy Photograph Collection, Public Archives of Nova Scotia)*

rail cars to the bricks themselves were manufactured on site. The last working pit pony in North America was led out of the Drummond mine in 1978 after the fan shaft collapsed.

wharves at Dunbar Point on the Northumberland Strait until 1880. The oldest surviving steam locomotive in Canada, it can be seen at the Nova Scotia Museum of Industry in Stellarton.

Many of these companies were instrumental in building railways to connect with the Intercolonial Railway, opening previously inaccessible areas of



Dril1ers at the site, near Rodney, of borehole 32 *put down in* 1913 *by the Cumberland Railway and Coal Company in its search for coal in the Springhill coalfield. (Photographed by the late Mrs. Rose Davis.)*

In Cumberland County, many companies opened small mines in the Joggins--Chignecto coalfield after 1858, but transportation problems hindered their growth and most failed. Soon after the Intercolonial Railway opened in 1872, coal mining increased significantly at Springhill, and it was here that the largest mines would operate until their closure in the late 1950s. In 1879, the Springhill and Parrsboro Railway Company (SPRC) received mining rights from the GMA, and five years later, the SPRC was succeeded by the Cumberland Railway and Coal Company. The management of the third company was taken over in 19l7 by the Dominion Steel and Coal Company, operators of mines in the Sydney coalfield. The old Syndicate mine on the No. 3 seam, operated by an American syndicate in the 1880s and by Springhill Coal Mines Ltd. During the 1960s, is now a miners' museum.

In 1887, the connection of the Maccan--Joggins railway with the Intercolonial Railway led to an increase in mining in the Joggins—Chignecto coalfields, and growth of communities like Joggins, River Hebert, Maccan, and Chignecto. The Joggins Coal Company Ltd. and the Maritime Coal Railway and Power Company were the major operators in this area. The Cochrane mine of the River Hebert Coal Co. at River Hebert was the last of approximately 83 small underground mines in the coalfield; it ceased operations in 1980. More than 97 mines operated in the coalfields of Cumberland County, rivaling the number of operations in the Sydney coalfield.

Small mining operations also took place in the less-extensive coal districts of the province. The Colchester Coal and Railway Company operated a mine in the Debert-Kemptown coalfield of Colchester County from 1903 to 1910. A mine at Kemptown was in production from 1920 to 1932 and a mine operated at Belmont in 1925. In the Richmond Basin of Cape Breton, the Tidewater fuel and Navigation Company operated a mine at Whiteside in 1928, one of three short-lived ventures undertaken by companies there. At Glengarry, Cape Breton Island, attempts at mining coal were made before and during the 1930s.

Underground coal mining history includes stories of tragic disasters and brave rescue efforts. In the Springhill coalfield, the phenomenon of rock bursts or "bumps" claimed many lives, and the worst of these, in 1958, signalled an end to major coal mining there. In the Pictou coalfield, the tendency of coal seams to burst into flames resulted in several tragic fires and explosions. In all coalfields, mechanical failure or human error has added to the list of misfortunes. The most catastrophic disaster in the history of Nova Scotia coal mining occurred on February 21, 1891, when 121 men and boys died in the No. 3 mine explosion at Springhill. The grim

With the opening of the International Railway came new mines and new towns in the Joggins-Chignecto coalfield of Cumberland County.

prophecy engraved in a Pictou County miners' memorial, "Be ye also ready," came to pass as recently as May 9, 1992, when an explosion in the Westray Mine claimed 26 lives. But even a single death was no less a tragedy to that miner's family.

The history of coal mining in Nova Scotia is more than the evolution of companies and opening and closing of mines. It is the history of the thousands of Nova Scotians who have worked in the coal mines, or who live in the coal towns. The work in the coal mines and

Relatives and co-workers wait for news of the fate of 267 miners trapped by a gas explosion in the No. 12 Colliery, New Waterford, on June 25, 1917. (Courtesy Glace Bay Miners Museum)

steel plants of Nova Scotia drew many men and their families from the British Isles and across Europe. As a result, the coal mining center of Sydney is said to have the most cosmopolitan population east of Montreal.

The difficult working condition in the early mines led to the secret formation in August 1879 of the Provincial Miners'' (later Workmen's) Association, the first trade union in North America, at Springhill. Labour unrest in the coal mines grew during the early 1900s; mounted police and troops were ordered on more than one occasion to break the strikes.

One such time was in June 1925, when a young miner from Springhill, Billy Davis, was shot and killed in a confrontation between miners and Company police at Waterford Lake, Cape Breton. Miners turned their anger and torches to the Company stores, and 2,000 troops were called in to suppress the strikers. Davis Day is recognized throughout the coal mining towns of Nova Scotia each year on June 11, when people pause to remember all those whose lives were claimed in the struggle to wrest coal from the earth.

Despite ever-present dangers, coal mining prospered throughout Nova Scotia during the first half of the twentieth century. By the late 1950s, however, coal mining in the province experienced a sharp decline because abundant, inexpensive imported oil was replacing coal in many of its traditional industrial and domestic markets. High transportation costs to the central Canadian market also helped make Nova Scotia's coal uncompetitive. Mining in the once prolific Springhill and Pictou coalfields came to a virtual standstill, although small operations continued in the Cumberland, Pictou, and western Cape Breton coalfields.

The formation in 1966 of a federal Crown agency, the Cape Breton Development Corporation (CBDC),eventually led to a revitalization of the coal-mining industry in the Sydney coalfield. CBDC initially incorporated the Dominion Steel and Coal Company and Old Sydney Collieries. Several smaller independent operators were later absorbed.

Miners in the Lingan Colliery,1985. (Owen Fitzgerald photograph)

With the upheaval In the world energy situation during the late 1970s, interest in the province's coal resources was rejuvenated. One of the driving forces behind the rebirth of coal in Nova Scotia was the decision by the Nova Scotia Power Corporation to switch their reliance from oil to Nova Scotian coal in order to avoid wide price swings in imported oil. As a result of this shift in fuel used to power Nova Scotia's power generators, only 25 per cent of our power is now generated by imported oil as compared to 70 per cent in the late 1970s. Most of Nova Scotia's electrical power is fuelled by the Cape Breton Development Corporation mines in the Sydney coalfield. The Prince Mine at Point Aconi and the Phalen Mine near Lingan together bring about three million tonnes of coal to the surface each year. Flooding in the Lingan Colliery hastened its closure in 1992, three months short of its planned 20-year life span. The Point Aconi power plant, opened in 1993, uses state of the art fluidized bed technology to reduce sulphur emissions from the burning of Cape Breton coal.

Renewed interest in the low sulphur coals of the Pictou Coalfield, also driven by environmental concerns, led to intensive private sector exploration during the 1980s and the opening in 1991 of the Westray Mine at Plymouth. Given the volatile and, at times, unstable status of available energy resources, the Coal Resources Section of the Nova Scotia Department of Natural Resources has set aside several emergency supply sites where coal could be mined quickly through open-pit operations should the need arise.

The Prince Mine is operated by the Cape Breton Development Corporation at Point Aconi. It mines the Hub Seam. (Owen Fitzgerald photograph)

Exploration and development of the province's coal resources is ongoing, a strong indication that the long history of coal mining in Nova Scotia will continue.

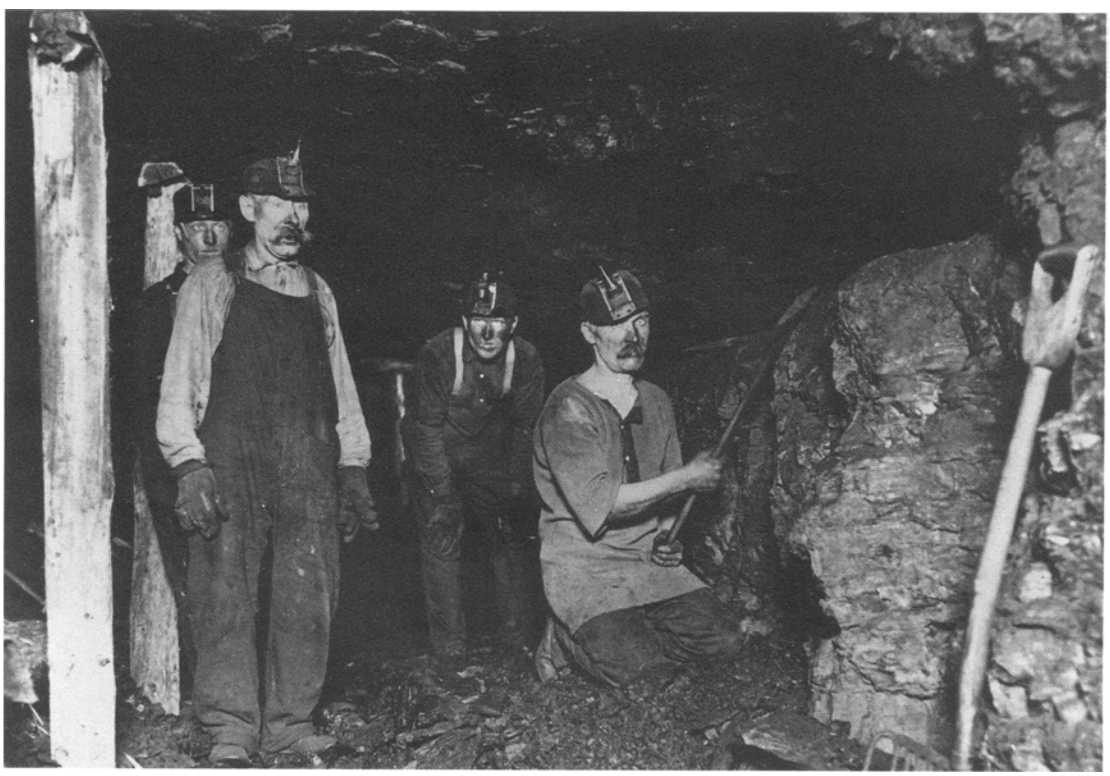
A Journey into an Underground Coal Mine in the 1830s

The following account by Joseph Howe appeared in the Novascotian on July 21, 1830, as part of his "Eastern Rambles." Howe's colourful description of his trip into an early coal mine (the Store Pit on the Foord Seam in Albion Mines) bears repeating, and for anyone who has visited the underground world of a cool mine, many of the sensations attending our first descent into a cool pit will still ring true.

"Jump upon that sled, seize hold of the chain...up we go for a foot or two--away slides the scaffold--and now my gentle Traveller, you are suspended over the mouth of the pit, and should any part of the tackle give way, you will have just about thirty seconds to say your prayers, before you are dashed to the consistence of a jelly, at the distance of 240 yards from where you at present hang...The Imaginative Traveller, as he descends through the circular shaft, which for a considerable distance down is cased with brickwork, may fancy that he is Captain Symmes travelling through the opening at the Poles, to pay a visit to the earth's centre.

At length the sled on which you stand reaches the bottom, and before you are aware, a few links of the chain may be coiling on top of your head; but be in no hurry to leap off--wait until the guide, who has accompanied you

In an early Nova Scotia coat mine, ca. 1880. (Courtesy Glace Bay Miners Museum)



in your passage, trims his lamp, and takes the lead, or mayhap you may bump your shins against a block of coal, or measure your length upon the bottom of the pit. For the first five minutes you can discover nothing; then you begin to see, as 'through a cloud darkly,' and at length, by the aid of the lamps carried about in different directions, you can find your way along without much risk of losing your foothold. And now you discern a lot of Beings, looking more like Demons than men, with their loose trowsers tucked up to their knees, their bodies only protected by a flannel shirt, the sleeves of which are gathered up to the elbow--the neck and breast being generally open—their heads are covered by a dose cap, something like a Welsh wig, and what adds to the singularity of their appearance, each has a small lamp suspended by a wire to the front of his cap--making them look like the Cyclops, who had but one glaring eye in his forehead. From head to heel these people are covered with the coal dust, which mixing with the perspiration drawn out by their hardy toils, gives to their features a singular, and rather a melodramatic expression. They look like neither blacks, whites, or mulattoes, but have an appearance peculiarly their own; their white teeth contrasting curiously with the sooty faces, as they crack their jokes, or carry on their desultory conversations. These people are variously employed--some are digging away with their pick axes into the coal measures, or boring holes for blasting; while others are loading the sleds, or driving the horses back and forwards from the place of excavation to the bottom of the shaft. These sleds run on a moveable railway extended along the level of the pit...and are presently sent up to the surface by the agency of steam. The incessant clatter of the Miners' picks--the rattling of the cool as it is filled into the sleds--the rapid passage of the horses to and fro—and the circulation of two or three dozen lamps, altogether make up as singular a combination of sights and sounds as the greatest lover of medleys might require…

…as singular a combination of sights and sounds as the greatest lover of medleys might require…

As the coal is dug put, the roof of the pit is supported by logs, which are stood on end and wedged in with plank, whenever the nature of the strata may seem to require them; large bodies of coal are left at certain distances for a similar purpose, and thus there is but little risk of danger from the falling in of the ceiling. 'But, Heaven preserve us, what was that? Are we blown to a thousand atoms? Are we suffocated by sulphur and fire damp? Are we not Iying, like an Egyptian Mummy, beneath a ponderous pyramid of ruins?' Nothing of the kind, my gentle Traveller, it Is only a blast which you might have seen two stout fellows preparing, and which has upturned as much coal as could serve to keep an old maid and her cat warm and comfortable, during the approaching winter."

Recollections of a Nova Scotian Coal Miner

Coal has played an important role in Nova Scotia history as long as people have been writing that history. It created towns and brought immigrants from Europe to work in the mines. It created wealth and poverty at the same time. It ignited rebellion: people still talk about the machine gun nest that was set up on Senator's Corner in Glace Bay during the 1925 strike that ended the tyranny of the Company store. It marks each person it touches in a different way, and each person it has touched has .a story about coal.

coal from the coal face to the landings, where it was then carried to the surface by rail. He remembers his first impressions of the mine, formed as he rode a rail car from the bottom of the mine to the stables. "I wanted to go home," he says. It was dark, noisy, and cold. The stables for the pit horses were underground, about a mile from the mouth of the mine and half an hour's walk to the coal face. He would walk beside the coal cart the horse hauled, shining the light from his hard hat so that the horse could see where it was going.

The Company Store, Caledonia, ca. 1890. (Owen Fitzgerald Collection

One of those people is Clinton MacPherson, of Port Morien, who retired recently after 39 years in the Sydney coalfields. He started with the Dominion Coal Company in Number 20 colliery at the age of 17. His first job was driving the horses that hauled the

He got up at 4: 30 each morning to catch the 5:00 Sydney and Louisbourg train into Glace Bay. They called the train the "Hobo" because it was made up of boxcars fitted with benches. The train went to all the collieries and to the machine shop. At the end of a shift, at 3:00, there was time for a shower at the mine before the Hobo took the men home.

Mining was physically demanding work under poor working conditions. "It was dirty and dangerous," Clinton says. Explosions are the hazard we think of

Pit pony underground in the No. 11 Colliery, near Glace Bay, which operated on the Emery scam. Ponies hauled coal cars and were stabled underground. (Courtesy Beaton Institute)

In the 1940s, miners were paid each week in cash, $3.74 a day to work six days or five nights a week, 52 weeks a year. No one had paid vacations in those days. They didn't work Christmas Day or holidays, but they didn't get paid for them, either. In 1947, the miners went on strike for better working conditions, more money, paid vacations, and paid holidays. They also wanted fairer pay: in those days, a married man earned more than an unmarried man. This was a quiet strike, which lasted from January to June that year.

most readily. That was true in the 1940s as well. Number 20 was a room and pillar mine. When Clinton first worked there, coal was mined using a cutting, shooting, and loading method. The men on one shift cut a five-foot hole in the coal face. The next shift drilled holes, which they filled with powder. They exploded the powder one hole at a time to loosen the coal, which the next shift loaded into carts. Coal dust produced by mining and methane gas given off by the coal can produce violent explosions if ignited by sparks.

At the end of a shift, miners take their seats on the rake for the ride to surface. (Owen Fitzgerald photograph).

There were other dangers as well. Within a year after Clinton began working in Number 20, four or five men were killed .They were standing on top of a coal cage as it rose to the top of the mine. It tipped and they fell to the bottom. Three years after he began working at the mine, he lost his small finger. He was training a horse named Cruiser to hour coal. They reached a curve in the road within the mine too quickly and the box tipped. The hand resting on top of it was crushed between the one-ton box and the roof of the mine. Longwell mining, although safer, was not without its hazards.

While Clinton was cutting stone overhead, to put up steel arches, some of it broke loose and fell on him breaking his arm.

The miners tended to take accidents in their stride and hope another wouldn't happen. Most accidents were blamed on human carelessness, not on the company. It was easy in this underground world to become superstitious about accidents. Some wouldn't work for two days before Christmas or miners' vacation (after they won the right to have vacations. People felt 1here was a better chance of being injured on those days than on other working days. "It got to the point where the company had to put the clamps on because no one was showing up to work the day before miners' vacation, and the company was losing a day's work," says Clinton.

He worked as a miner for 29 years, until a back operation prevented him from doing this work. He worked in several mines in Port Morien and Glace

Hydraulic roof shields and longwall face shearer in a modem coal mine of the Sydney coalfield. (Owen Fitzgerald photograph).

Bay, at several different jobs. The last work he did was driving an electric underground train. He hauled 60 to 75 boxes of coal a day from the loading head to the pit bottom.

The biggest change he saw over the years was the change in technology from room and pillar to longwall mining. Longwall mining was a great improvement because the work was safer and less physically strenuous. There were fewer small injuries and less chance of the roof falling in. The Dosco Miner, the equipment used in longwall mining, created more dust than a shovel, but the men didn't work in the dust, they worked behind it.

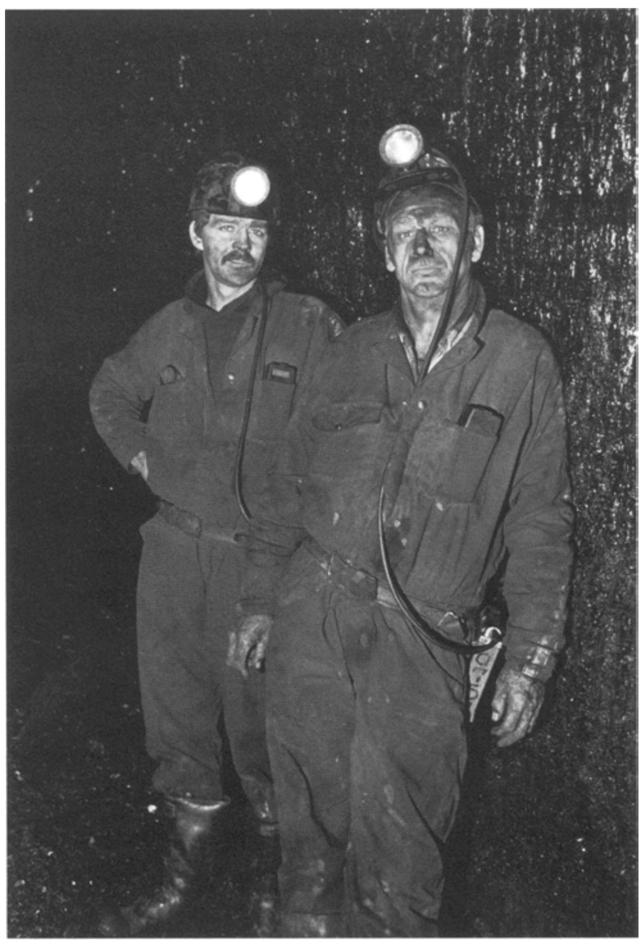
The way men were paid also changed over the years. In the early years, they were paid by the amount of coal they produced. Later, they were paid by the hour, and a bonus was added after a certain number of tons was produced.

The camaraderie amongst coal miners is striking to anyone who has ever gone underground. Above ground, coal miners stuck together as well. They supported each other and each other's families during hard times. "It was thankless work, but the men who worked together were friends," says Clinton.

In the 1940s, when Clinton MacPherson began mining coal, coal affected everyone. It heated homes and farms and generated electricity. Because it created jobs for most of the men in and around Glace Bay, rural women contributed significantly to running the farms, in some cases being fully responsible.

Coal played a part in every life near the Sydney coalfield in those days. Today, coal touches all our lives through the electricity we use, but perhaps fewer people are aware of coal mining and how coal is mined to produce our electricity. Swimmers notice particles as fine as sand being sifted by the waves on the beach in Port Morien. Explorers search for fossils on the cliffs of the old French mine. Thousands of men still mine coal in Cape Breton. It still heats our homes whether in stoves or by electricity. But everyone has a story of someone who was a memorable character, someone who was injured, or someone who acted heroically, and coal still lives in stories about people.

(Owen Fitzgerald photograph)



Some Geological and Coal Terms

alluvial fan
a generally cone-shaped deposit of sediments (mud, sand, gravel) formed by streams flowing from mountains onto a level plain

Anthracite
the highest rank of coal, consisting almost entirely (92 to 98 per cent) of carbon. Anthracite coal is so hard it can be sculpted. In Nova Scotia, the highest rank of coal is Semi-anthracite.

anticline
an upward fold in stratified rocks

ash content
the inorganic residue that remains after coal is burned; expressed as a percentage of the weight of the coal

bed
a layer of sediment turned to rock

beneficiation
a general term referring to any process that improves the quality of the coal after it is mined

Bituminous coal
coal that contains more than 14 per cent volatile matter and that releases 11,400 BTU of energy per pound (26.7 Mj/kg) when burned. It is one of the higher ranks of coal and may be suitable for making steel.

chaldron
an old measure of coal equal to 36 bushels

coal
fossil peat; a layered rock composed largely of chemically and physically altered plant remains mixed with a lesser amount of inorganic material (ash)

coal basin
an area originally a topographic lowland, that has been infilled by sedimentary rocks, including coal; usually bounded by faults or by ancient uplands

coalfield
a region in which coal deposits of economic value occur

coalification
the transformation of peat into coal

coal measures
a succession of sedimentary rocks in which beds of coal occur

compaction
a decrease in the volume of sediments, largely through water loss, usually due to continued deposition above them

competent
layers of rock strong enough to support their own weight plus the additional weight of overlying rocks

conglomerate
a sedimentary rock containing fragments of gravel or pebbles

diamond drilling
a form of drilling commonly used by geologists to retrieve rock samples from beneath the earth's surface; uses a rotary drill bit impregnated with industrial diamonds to cut through rock.

dip
the angle a rock bed makes with the horizon; water dropped on a bed will run in the direction of the dip

dragline
a large machine (usually track-mounted) that uses an earth-scraping bucket suspended by cables from a derrick to excavate earth or rock; often used in large scale open-pit mining

evaporite
a sediment deposited after water evaporates (for example, salt)

face
refers to that section of the coal seam currently being mined or developed

fault
a fracture or zone of fracture along which displacement has occurred

fixed carbon
the solid part of coal, other than inorganic ash; remaining after the volatile matter is driven off

floodplain
the portion of a river valley built of sediments deposited by the river and occasionally covered by river floodwaters

fluvial
pertaining to rivers

fold
a bend in layers of rock

graben
a block bounded by faults that has been downthrown relative to rocks on either side, forming a basin

lacustrine
pertaining to lakes

Lignite
an intermediate form of coal between pear and sub-bituminous coal (less than 19.3 MJ/kg or 8.300 BTU/lb); sometimes called brown coal

liquefaction
the process of making coal into a liquid

lithology
the physical character of a rock
metallurgical
pertaining to the production of raw metallic materials, including processes such as smelting

mudstone
a hardened rock composed of clay- and silt-sized grains; not easily split along bedding planes (see shale)

oil shale
a sedimentary rock from which oil can be distilled. Some Nova Scotia oil shales are a type of coal composed of tiny plant fragments deposited in lakes

overburden
(1) in economic geology, the barren rock material overlying a coal seam;
(2) the unconsolidated, loose mud, silt, sand and grave] overlying bedrock

paleo
ancient

paleontology
the study of ancient life

panel
a large rectangular block of coal being prepared for underground mining

peat
a layer of plant material that accumulates beneath a waterlogged swamp or bog

rank
the stage that a coal has reached in the transformation from peat: stages include peat, lignite, bituminous coal and anthracite

reserve
the amount of coal that can be mined economically

resource
the amount of coal in place, estimated with varying degrees of certainly (measured, indicated, inferred) by geological methods

sandstone
a sedimentary rock made up mostly of sand-sized grains

seam
a tabular laterally extensive bed of coal

sedimentary
formed of sediment (of sand grains, for example)

seismic survey
a survey that provides a picture of the structure of rocks beneath the earth's surface. It uses explosive charges or vibrations to create sound waves that bounce off the layers of rock

shaft
a vertical tunnel giving access to a coal seam; used mainly when access is not practical by slope, or when the coal lies at great depth

shale
a sedimentary rock, primarily composed of clay-sized grains, that readily splits along bedding surfaces

siltstone
a very fine-grained rock composed primarily of silt-size grains

slope
a sloping tunnel access to a coal seam, often beginning at the surface. Most Nova Scotia mines use slopes

spore
a tiny, often microscopic, reproductive part of plants; the study of fossil spores and pollen is termed palynology, a method geologists use to compare ages of coal-bearing rock

strata
layers of sedimentary rock

stratigraphy
a geological discipline involved with mapping the distribution of rock beds

subsidence
downward settling of the earth's surface

sulphur content
the percentage of coal weight made up of organic sulphur, sulphides and sulphates

syncline
a downward fold in rock beds

thermal coal
broadly referring to a major use of coal as a source of energy in steam boilers such as those of electrical power-generating stations

volatile matter
gases and vapours driven off from coal during heating

Suggested Reading

Bell, W.A. 1944. Carboniferous rocks and fossil flora of Northern Nova Scotia; Geological Survey of Canada Memoir 238.

-1940. The Pictou Coalfield; Geological Survey of Canada Memoir 225.

-1966. Carboniferous plants of Eastern Canada; Geological Survey of Canada Paper 66-11.

Fossil flora of the Sydney Coalfield, Nova Scotia; Geological Survey of Canada Memoir 215.

Bellamy, D. 1991. Wetlands: Draining the world dry; in J. Porritt (editor), Save the Earth; McClelland and Stewart, Toronto.

Brown, R. 1871. The coalfields and coal trade of the Island of Cape Breton, London.

Brown, R.D. 1976. Blood on the coal (The story of the Springhill mining disaster), Lancelot Press, Windsor, Nova Scotia.

Calder, J.H., Bain, C.E., Chesal, S., Gillis, K.S., MacNeil, D.J., Naylor, R.D. and Palmer, W.J. 1985. Coal in Nova Scotia, Nova Scotia Department of Mines and Energy.

Cameron, J.M. 1974. The Pictonian Colliers, Nova Scotia Museum.

Carroll, R.L., Belt, E.S., Dineley, D.L., Baird, D., and McGregor, D.C. 1972. Vertebrate paleontology of Eastern Canada; Excursion A59, XXIV International Geological Congress.

Dawson, J.W. 1855. (other editions 1868, 1878, 1891) The Geology of Nova Scotia, New Brunswick and Prince Edward Island or Acadian Geology, Oliver and Boyd, Edinburgh.

Donohoe, H.V. Jr., Grantham, R.G., Fader, G.B., Martell, D.J. and Raeside, R.P. 1989. Geological highway map of Nova Scotia, Atlantic Geoscience Society, Special Publication No. 1 (second edition), Halifax.

Ferguson, L. 1988. The fossil cliffs of Joggins, Nova Scotia Museum, Halifax.

Gesner, A. 1836. Remarks on the Geology and Mineralogy of Nova Scotia, Gossip and Coade, Halifax.

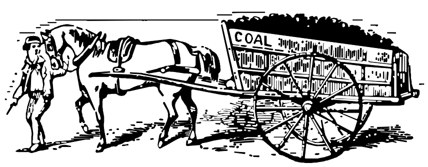
Gibling, M.R., Calder, J.H. and Naylor, R.D. 1992. Carboniferous Coal Basins of Nova Scotia; Field Guide, Excursion C-1, Geological Association of Canada Annual Meeting, Wolfville; Atlantic Geoscience Society.

Hoegg Ryan, J. 1992. Coal in our blood: 200 years of coal mining in Nova Scotia's Pictou County, Formac.

Scott, A.C. 1991. Coal: Its origin and future; Teaching Earth Sciences, vol. 16, p. 24-36.

Smith, W.D. and Naylor, R.D. 1990. Oil shale resources of Nova Scotia, Nova Scotia Department of Mines and Energy Economic Geology Series 90-3

Zodrow, E.L. and McCandlish, K. 1980. Upper Carboniferous fossil flora of Nova Scotia, The Nova Scotia Museum, Halifax.



Appendix: Do-It-Yourself

The following agencies, museums and events can assist those interested in gathering additional information on coal in Nova Scotia as well as on the general geology and mining history of Nova Scotia.

Agencies

Nova Scotia Department
of Natural Resources
1701 Hollis Street
PO Box 698
Halifax, Nova Scotia B3J 2T9
(902) 424-4161, 424-8633,
424-5364
and
32 Bridge Street
PO Box 999
Stellarton, Nova Scotia BOK 1SO
(902) 752-8429

Geological Survey of Canada
601 Booth Street
Ottawa, Ontario K1A OE8
(613) 995-4946

Public Archives of Nova Scotia
6016 University Avenue
Halifax, Nova Scotia B3H 1W4
(902) 424-6060

Beaton Institute
University College of Cape Breton
PO Box 5300
Sydney, Nova Scotia B1}P 6l2
(902) 564-1336

Universities and colleges (Departments of Geology) and public libraries throughout Nova Scotia.

Museums

The Cape Breton Miners Museum
Birkley Street
Glace Bay
Cape Breton County
Nova Scotia
(902) 849-4522

Cumberland County Museum
150 Church Street
Amherst, Nova Scotia
(902) 667-2561

Geological Mineral and Gem Museum
Parrsboro, Nova Scotia
(902) 254-3266

Inverness Miners Museum
Railway Street
Inverness, Nova Scotia
(902) 258-2097
(902) 258-3291

Joggins Fossil Center
Joggins, Cumberland County
Nova Scotia
(902 251-2727 (2618 off-season)

Miners Museum
Black River Road
Springhill
Cumberland County
Nova Scotia
(902) 597-3449

Nova Scotia Museum
1747 Summer Street
Halifax, Nova Scotia
i902) 424-7353

Nova Scotia Museum of Industry
Foord Street
Stellarton, Pictou County
Nova Scotia
(902) 755-5425

Parrsboro Geology Museum
Parrsboro, Cumberland County

Stellarton Mining Museum and Library
Stellarton, Nova Scotia
(902) 755-4646

Field Trips

Annual "Rockhound Roundup”
Parrsboro, Nova Scotia
(August, each year)

Joggins Fossil Center
Joggins, Cumberland County
Nova Scotia
(guided tours)

(Owen Fitzgerald photograph)


Nova Scotia
Department of
Natural Resources

Printed on papers that
contain recycled fibre