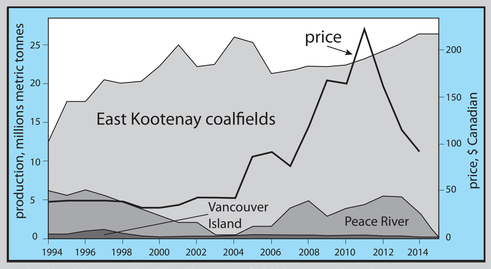
The East Kootenay Coalfields

British Columbia Geological Survey Information Circular 2015-10

Context

The East Kootenay Coalfields is one of several coal regions in British Columbia, including the Groundhog and Peace River fields in the north, those on Vancouver Island, and small fields in the interior. Extending along the northwest-southeast structural grain of the Rocky Mountain Front Ranges in southern British Columbia, the East Kootenay Coalfields includes three fields: Flathead, Crowsnest, and Elk River.

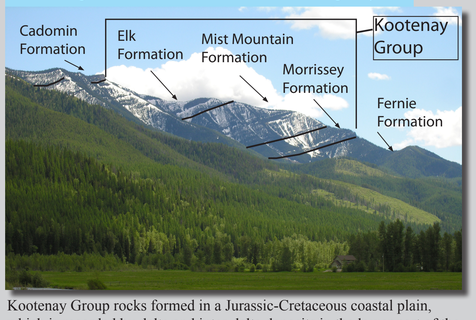


In the last 20 years, the East Kootenay fields have produced more coal than the rest of British Columbia's coalfields combined.

Stratigraphic setting

The East Kootenay fields produce coal from multiple seams in the Mist Mountain Formation, a 100 to 700 m thick unit of sandstone, siltstone, shale, and mudstone in the middle part of the Kootenay Group.

Fernie Ridge, between Fernie and Hosmer, from Highway 3



Kootenay Group rocks formed in a Jurassic-Cretaceous coastal plain, which is recorded by delta and inter-delta deposits in the lower part of the section that transition upward to fluvial deposits.

Lower Cretaceous	Blairmore Group		sandstone
		Cadomin Formation	conglomerate
Lower Jurassic to Lower Cretaceous	Kootenay Group	Elk Formation	sandstone, siltstone, shale, mudstone, chert-pebble conglomerate; minor coal seams
		Mist Mountain Formation	sandstone, siltstone, shale, mudstone, thick coal seams
		Morrissey Formation	medium- to coarse-grained quartz-rich sandstone
Jurassic		Fernie Formation	shale, siltstone, fine-grained sandstone

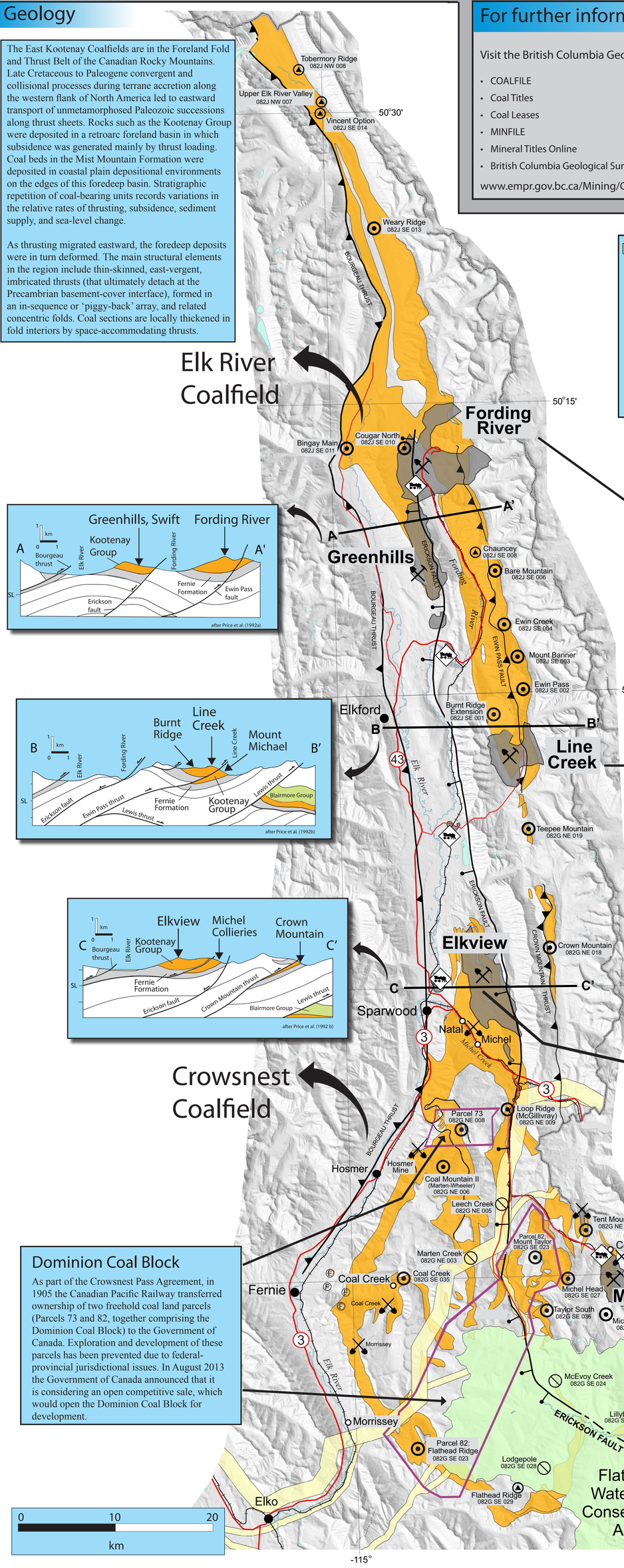
The Mist Mountain Formation contains from about 4 to 30 coal seams, depending on locale. These seams can have cumulative thicknesses of greater than 70 m. Thicker seams are more abundant lower in the section, but coal beds occur throughout the unit. Seams are locally thickened by repetition along thrust faults.

Multiple coal seams, Line Creek mine, Burnt Ridge pit

Geology

The East Kootenay Coalfields are in the Foreland Fold and Thrust Belt of the Canadian Rocky Mountains. Late Cretaceous to Paleogene convergent and collisional processes during terrane accretion along the western flank of North America led to eastward transport of unmetamorphosed Paleozoic successions along thrust sheets. Rocks such as the Kootenay Group were deposited in a retroarc foreland basin in which subsidence was generated mainly by thrust loading. Coal beds in the Mist Mountain Formation were deposited in coastal plain depositional environments on the edges of this foredeep basin. Stratigraphic repetition of coal-bearing units records variations in the relative rates of thrusting, subsidence, sediment supply, and sea-level change.

As thrusting migrated eastward, the foredeep deposits were in turn deformed. The main structural elements in the region include thin-skinned, east-vergent, imbricated thrusts (that ultimately detach at the Precambrian basement-cover interface), formed in an in-sequence or 'piggy-back' array, and related concentric folds. Coal sections are locally thickened in fold interiors by space-accommodating thrusts.



Dominion Coal Block

As part of the Crowsnest Pass Agreement, in 1905 the Canadian Pacific Railway transferred ownership of two freehold coal land parcels (Parcels 73 and 82, together comprising the Dominion Coal Block) to the Government of Canada. Exploration and development of these parcels has been prevented due to federal-provincial jurisdictional issues. In August 2013 the Government of Canada announced that it is considering an open competitive sale, which would open the Dominion Coal Block for development.

Geology after Pearson and Grieve (1978) and Price et al., (1992a, b).

For further information

Visit the British Columbia Geological Survey coal website to access

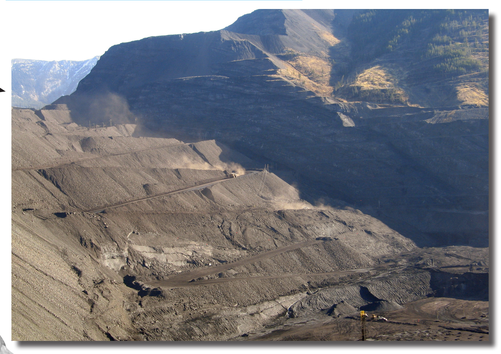
- COALFILE
- Coal Titles
- Coal Leases
- MINFILE
- Mineral Titles Online
- British Columbia Geological Survey Publication Catalogue

www.empr.gov.bc.ca/Mining/Geoscience/Coal/Pages/default.aspx

Fording River mine, Turnbull pit

Line Creek mine, south pit

Elkview mine, Elk pit



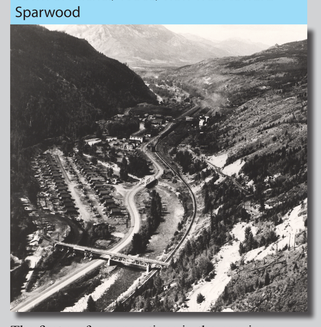
History

Prospectors discovered coal in the East Kootenays in the middle 1800s. By 1885, following George Mercer Dawson's report on the geology of southeast British Columbia, the coal wealth of the region was well known. However, infrastructure to bring the coal to market was lacking. In 1896 the Government of Canada and Canadian Pacific Railway signed an agreement to build a rail line through Crowsnest Pass.

Coal Creek mine, 1950s; now abandoned Coal Creek townsite in background

The turn of the century saw underground mines open and small settlements established adjacent to the Crowsnest Pass route at Morrissey Creek, Coal Creek, Michel, Natal, Middletown, Hosmer, and Corbin. Between 1898 and 1902 the town of Fernie was built at the confluence of Coal Creek and the rail route along the Elk River to accommodate increasing numbers of miners and their families. Hundreds of coke ovens were built at Fernie, Morrissey, and Michel to produce coke for smelters in the Kootenay and Boundary areas.

Town of Michel, 1950s; view west toward Sparwood



The first surface operations in the province opened near the town of Michel in 1947 (Erickson) and 1949 (Baldy Mountain). Mining continued at Coal Creek and Michel-Natal through World War II and into the 1950s, by which time the industry was in decline, mainly because oil products were being substituted as fuels for transportation and heating. In the 1960s, the Government of British Columbia ordered that Michel residents be relocated to Sparwood and old mine buildings demolished. The towns were vacated by 1971; today, very little remains of Michel, Middletown, and Natal.

In the 1960s, rapid expansion of manufacturing in Japan led to increased global prices, and renewed interest in the high-quality coking coals of the Canadian Rockies. The Balmer mine north of Michel and Natal (now part of the Elkview mine) was converted into a modern mechanized operation. In 1972 Fording Coal began production at the Fording River mine in the Elk Valley coalfield. In 1974, the Corbin mine was reopened as the Byron Creek Collieries and began producing thermal coal for power generation in Ontario. In 1982, Shell Canada opened the Line Creek mine, and Westar Mining opened Greenhills. Byron Creek Collieries was renamed Coal Mountain in 1994. Collectively, Fording River, Greenhills, Line Creek, Elkview (including Balmer and Baldy Mountain) and Coal Mountain have produced between 20-30 million tonnes a year since the 1980s. All five mines consolidated as the Elk Valley Coal Partnership in 2004. Since 2008, Teck Coal Limited has been the operator and primary owner of all five active mines.

Historical production

Coal Creek	18 Mt	1898-1958	underground
Michel Colliery	69 Mt	1899-1911 1948-1979	underground
Morrissey	0.4 Mt	1902-1909	underground
Hosmer	0.8 Mt	1908-1914	underground
Corbin; renamed Byron, 1974	3.4 Mt	1908-1935 1943-1948 1974-1994	underground
Tent Mountain	2.7 Mt	1950-1980	open pit

Since 1898, over 780 million tonnes, mainly of metallurgical coal, have been produced from the Crowsnest and Elk River fields.

The coal

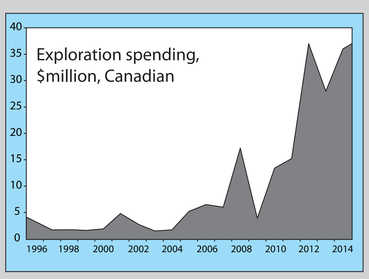
Most coals in the Mist Mountain Formation are coking coals. They are predominantly medium-volatile bituminous in rank and have low sulphur content. High-volatile A bituminous coals occur near the top of the unit; low-volatile bituminous coals occur near the base of the section.

Hard coking coal (HCC) is the predominant product at the Elk River coalfields except at the Coal Mountain mine, which produces mainly PCI (pulverized coal injection) product. Coals lacking coking quality because of high volatile content, ash content, or oxidation are produced in minor amounts at Fording River, Line Creek, and Greenhills, and are marketed as PCI or thermal coal.

Present exploration and production

Exploration in the East Kootenay Coalfields is sensitive to fluctuations in global coal prices.

Coal prices rose in the mid-2000s, when China became a net importer, and spiked in 2011 due to catastrophic flooding of coalfields in Western Australia.



Since 2008, Teck Coal Limited has been the operator and primary owner of all five active mines. These mines produce about 70% of Canada's total annual coal exports.

	Pits and Expansions	Products	Production capacity	Mine life	Years of operation	Reserves; Proven + Probable, Dec 31, 2014) clean coal	Resources Measured + Indicated Dec 31, 2014, Raw coal
Fording River	Pits: Henretta, Turnbull, Castle Mt, Eagle Expansion: Swift	*HCC, Thermal	~9 Mt/yr	70 years	1972 - present	HCC 620 Mt Thermal 4.5 Mt	HCC 1149 Mt Thermal 9 Mt
Greenhills	Pit: Cougar South Expansions: Cougar North; merging with Swift	HCC, **PCI, Thermal	~5.2 Mt/yr	14 years	1993 - present	HCC 61 Mt PCI 4 Mt Thermal 1 Mt	HCC 264 Mt PCI 11 Mt Thermal 4 Mt
Line Creek	Pits: Horseshoe, Burnt Ridge South Expansions: Mt. Michael, Burnt Ridge North	HCC, PCI Thermal	~3.5 Mt/yr	19 years	1972 - present	HCC 67 Mt PCI 3 Mt Thermal 9Mt	HCC 712 Mt PCI 1 Mt Thermal 9 Mt
Elkview	Pits: Natal, Harmer, Balmer, Baldy Extension: Baldy Ridge	HCC	~6.5 Mt/yr	29 years	1859 - 1970 1980 - present	HCC 215 Mt	HCC 705 Mt
Coal Mountain	Pits: 37-pit, 6-pit	PCI, Thermal	~2.7 Mt/yr	6 years	1908-1948 (as Corbin) 1974-1994 (as Byron) 1994-present	PCI 7 Mt	PCI 83 Mt

* Hard Coking Coal ** Pulverized Coal Injection product

Flathead Watershed

In 2011 the British Columbia Government enacted the Flathead Watershed Area Conservation Act, prohibiting tenure acquisition and mineral exploration in the Flathead River watershed, thus excluding the Flathead coalfield and part of the Crowsnest coalfield from mining activity.

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Flathead Watershed Conservation Act http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_11020_01

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